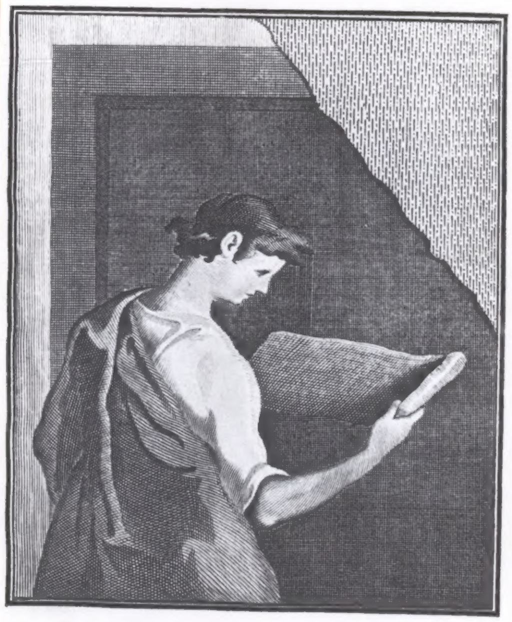

TRANSACTIONS

OF

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

VOL. VI. NEW SERIES, 1890

Seventeen hundred and fifty copies of this Volume have been printed for the use of the members of the Royal Institute, and for that of Allied and other kindred Societies, Public Libraries, and Educational Institutions, throughout the British Empire and in Foreign Countries.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

Incorporated Seventh of William IV. and Fiftieth of Victoria.

From a painting by R. Boxall, R.A.

PROFESSOR COCKERELL, R.A.

PRESIDENT 1860-61. ROYAL GOLD MEDALLIST.

[See page 259.]

The Royal Institute of British Architects

INCORPORATED SEVENTH OF WILLIAM IV. AND FIFTIETH OF VICTORIA

TRANSACTIONS: VOL. VI. NEW SERIES

FIFTY-SIXTH YEAR OF FOUNDATION

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LONDON
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1890

TRANSACTIONS, VOL. VI. NEW SERIES: CONTENTS.

	Frontispiece.—Portrait of Professor Cockerell.		
	The Session 1889-90: Abstracts of Mr. Waterhouse's Addresses		1
LXV	The Application of Iron and Steel to Building Purposes	F. T. Reade, *Hon. Associate*	13
	Abstract of the Discussion		35
	[Here follow Illustrations i, ii, between pp. 28 and 29.]		
LXVI	Report of a Tour in Greece and Cyprus	R. Elsey Smith, *Associate*	37
,,	Notes on the same	Francis C. Penrose, M.A.Cantab., *Past Vice-President* (*Royal Gold Medallist*)	66
	[Here follow Illustrations iii to vi, between pp. 52 and 53; and Illustrations vii, viii, between pp. 60 and 61.]		
LXVII	The Architecture of Provence	Mr. David MacGibbon	69
,,	Abstract of the Discussion		85
	[Here follow Illustrations ix to xiv, between pp. 76 and 77; and Illustrations xv to xviii, between pp. 84 and 85.]		
LXVIII	The Renaissance in Northamptonshire	J. Alfred Gotch, *Fellow*	87
,,	The Building of Burghley House		103
,,	A Sixteenth-Century Account		109
,,	Abstract of the Discussion		113
	[Here follow Illustrations xix to xxi, between pp. 92 and 93; and Illustrations xxii to xxix, between pp. 100 and 101.]		
LXIX	Building Legislation	John Slater, B.A.Lond., *Member of Council*	115
,,	Abstract of the Discussion		137
LXX	The Galilee of Durham Cathedral: its Name and its Nature	William White, F.S.A., *Fellow*	141
,,	Abstract of the Discussion, and Notes		152
	[Here follow Illustrations xxx to xxxii, between pp. 148 and 149.]		
LXXI	Church Fittings	John P. Seddon, *Fellow*	165
,,	Notes on the same	William White, F.S.A., *Fellow*	184
,,	Abstract of the Discussion		185
	[Here follows Illustration xxxiii, between pp. 180 and 181.]		
LXXII	German Technical Museums	Frank Granger, M.A. Lond., *Associate*, Holder of the Godwin Bursary	187
LXXIII	The Arab House of Egypt	Count R. d'Hulst	221
,,	Notes on the same	R. Phené Spiers, F.S.A., *Member of Council*	228
,,	,, ,, ,,	John D. Crace, *Hon. Associate*	237
,,	Abstract of the Discussion		241
	[Here follow Illustrations xxxiv to xxxvii, between pp. 228 and 229; and Illustrations xxxviii, xxxix, between pp. 236 and 237.]		
LXXIV	St. Stephen's, Walbrook	Francis C. Penrose, M.A.Cantab., *Past Vice-President* (*Royal Gold Medallist*)	243
	[Here follow Illustrations xl to xlii, between pp. 244 and 245.]		
LXXV	A Notice of the late Mr. Pullan, F.S.A., *Fellow*	Professor Aitchison, A.R.A., *Vice-President*	249
LXXVI	Charles Robert Cockerell, R.A., Second President of the Royal Institute of British Architects, 1860-61	Professor Aitchison, A.R.A., *Vice-President*	255
	[Here follows an Illustration without title or number, being a facsimile of a pencil drawing by Ingres, between pp. 260 and 261.]		
	Index to the Volume		263

The Royal Institute of British Architects

INCORPORATED SEVENTH OF WILLIAM IV. AND FIFTIETH OF VICTORIA

THE SESSION 1889-90.

THE OPENING MEETING of the Session was held on Monday, 4th November 1889, when Mr. ALFRED WATERHOUSE, R.A., delivered his Presidential Address,* which he commenced with a reference to the new By-laws, approved by the Privy Council on the 7th February 1889, and of which one of the most important authorised the alliance, under certain conditions, of non-Metropolitan Architectural Societies with the Royal Institute. In consequence of that provision, and after the necessary negotiations, nine Societies had entered into alliance with the Institute, viz. :—the Sheffield Society of Architects and Surveyors, the Leicester and Leicestershire Society of Architects, the Manchester Society of Architects, the Glasgow Institute of Architects, the Northern Architectural Association (Newcastle), the Bristol Society of Architects, the Nottingham Architectural Society, the Royal Institute of the Architects of Ireland, and the Liverpool Architectural Society. The Presidents of seven of the nine Bodies had been elected in June members of the Council, and all the nine allied Societies were then assisting in the conduct of local examinations under the new system, as Liverpool that year, and Glasgow, Leeds, and Manchester in previous years, had most efficiently under the old. The alliance of these Societies and their cordial co-operation for the advancement of architecture were, the PRESIDENT thought, among the most pleasing and satisfactory results of the working of the new Charter, and a happy augury for the future ; and he added that the Australian

* The Address, in its entirety, is printed in *The R.I.B.A. Journal*, Vol. VI., pp. 21–34.

Societies desired to join the alliance, the question of holding examinations in Sydney and Melbourne being under consideration. After alluding to the fact that the members of the existing Council were the first elected by voting papers issued and returned by post, the PRESIDENT stated that during the past Session 112 gentlemen were admitted to the Examination in Architecture, of whom 82 had passed, while 81 Associates had been elected; and he maintained that, instead of being a deterrent, the Obligatory Examination seemed to be a positive attraction to the young architect. Sixty-two Fellows had also been elected, of whom twenty-six had been Associates. "With that satisfactory "increase," said the PRESIDENT, "the number of subscribing members reached "a total last September of 1,350, as against 1,200 in 1887, and 1,190 in 1885, "at the same period of the year." With such additions, and with a Council increased from twenty-one to thirty-four members, came the pressing consideration of how they could best gain the needed expansion of their premises; and on this their Council might shortly be expected to submit an important proposal. Greater space was wanted for the ever-increasing Library, now rendered still more valuable by the publication of a catalogue—the gift of Mr. BRANDON—and better and more private accommodation for the conduct of the ordinary business, which had also largely increased. Mention was then made of the Royal Gold Medal for the Promotion of Architecture, which had been presented in June, with Her Majesty's gracious sanction, to Sir CHARLES T. NEWTON, K.C.B., the learned archæologist, a tribute not only to his conspicuous personal attainments, but also to the merits of that great Institution with which Sir CHARLES had been so long connected. With the conspicuous exception of this Royal Medal, British architects did their work without much intervention, or even recognition, from the State. An eminent Corresponding Member of the Institute, a member of the German Parliament, Dr. REICHENSPERGER, who had been one of the judges in the great competition for Lille Cathedral, and who enjoyed a cosmopolitan reputation, had explained the attitude of the State towards the British architect in interesting terms, viz.:—"The well-known aversion of the English to bureaucratic over-"governmentation exhibits itself even in the domain of art, especially in that "of architecture. There is on the other side of the Channel no hierarchically "classified and betitled band of architectural officials; neither do we meet in "England with establishments founded and supported by the State for the "education of architectural students, nor with governmental examinations, "nor with official diplomas thereupon granted. Nevertheless, the English "continue to execute architectural works of all kinds, not only in no respects

"inferior to our own, but, in my estimation, actually superior from an æsthetic "point of view." Such praise from a well-known German, coming as it did with almost similar eulogistic comment from French architects of distinction, ought to be some consolation to those tempted to think that from authorities at home abuse came more naturally than honours. There had been, however, a very gratifying instance to the contrary during the past year, in the knighthood conferred on their colleague and former Vice-President, Sir Arthur Blomfield, A.R.A., at which all rejoiced, not only on account of his personal qualities and of the knowledge of the beauty of the buildings he had executed, but because it was a recognition from the Throne itself of the excellence of English architecture, as illustrated in Sir Arthur's works.

The President next referred to a new, or rather amended, form of Articles of Pupilage, which though, at the instance of the Council, carefully prepared by the Practice Standing Committee, had been rejected at a Special General Meeting of the Institute, in consequence of the omission—due to a desire expressed by a majority of the Council—of the words "and surveyor" from the title of the third party to the contract, namely, the architect; and he ventured to suggest as a compromise, that a blank be left in which the word "architect" or the words "architect and surveyor" could be inserted as might be deemed fit. The new form, which had been approved in substance by the General Body, made certain provisions for pupils preparing for the Institute Examinations, and for the refunding of a portion of the premium in case of the inability of the principal to perform his side of the engagement.

Turning to the question of Examinations, the President alluded to the discussion that had taken place in April, especially with reference to some remarks made by the Professor of Architecture at the Royal Academy, which appeared to have great weight although they were not supported. "The "Professor," continued Mr. Waterhouse, "would make no enquiries in the "Examinations as to the historical or archæological knowledge of the student "under examination, but simply test his fitness as a building-constructor, "entirely irrespective of his knowledge of archæological peculiarities or, in "other words, styles of architecture." The President thought it most desirable for every architect to know a little about the styles which had brought architecture to its present position, but it was also important that the Examinations should never in any way fetter a student, and under the existing system the utmost freedom was allowed the students in all that concerned the inventive side of their art. A discussion had also taken place in

January, on the award of the Soane Medallion and other prizes, when it had been advocated that a design might be premiated which did not fulfil the prescribed conditions and was avowedly unfit to be applied to the purpose for which it was intended, if only it displayed some excellence of design, or rather some originality in external appearance, obtained, perhaps, at a sacrifice of internal convenience. That, in his opinion, was a very mischievous doctrine. If structures were not fit for their purpose, much public appreciation could not be hoped for, however striking their appearance might be. "Buildings without a purpose, or unfit for that purpose, may," said the President, "from their artistic qualities, arouse our enthusiasm as antiquaries "or archæologists; but, depend upon it, we should look upon them with other "feelings if we had had to pay for them ourselves, or if we were to try to "use them. Architecture, to me, implies art under certain well-defined con-"ditions. If unrestrained by these conditions, it lacks its first requisite: its "adaptation to certain chiefly human requirements; and it becomes a kind "of constructive stage scenery. The more closely our students, and in fact "all of us, stick to the conditions of the problems we have to solve, while "striving at the same time to give our work the highest artistic expression "of which we are capable, the sooner, in my humble judgment, will modern "architecture secure public appreciation."

The President considered the most noteworthy event of the current year to be the International Exhibition in Paris, and thought the French themselves had done wonders, both in the way of exhibits, and in the buildings in which they were displayed. It might be difficult in every instance to admire the details of some of these buildings, but it was only right to pay a tribute of unstinted admiration to their originality, to the acceptance they displayed of new conditions and new materials, involving new forms and expressions. The domes of the two palaces of the Fine and Liberal Arts, by M. Formigé, deserved a further commendation as satisfying the faculties of æsthetic criticism by their pure form and admirable colour. The Eiffel Tower, so greatly dreaded by the lovers of old Paris—architects and the public alike—had been perhaps to many, as it had been to himself, an agreeable disappointment. Its individuality, its weblike construction, seemed to remove it from all sense of competition with its neighbours of ordinary dimensions in brick and stone. These seemed to hold their own, and not to be so disconcerted by its neighbourhood as he had anticipated. Perhaps this arose from the strikingly unusual and fantastic forms of the other Exhibition buildings. While thus confessing a certain admiration for the tower, the President yet felt a great

aversion to the prospect of a sister tower being erected in London. Men might look with equanimity on one such colossus as a wonder of the world without desiring to see it reproduced elsewhere. Some eyesores, though needless disfigurements, might be tolerated because of their undeniable public utility, for example, Charing Cross Station and Bridge, which had certainly not improved a grand river-view.

Having eulogised the courage displayed by the Parisians in embowering the gardens of the Exhibition and the streets of their city with full-grown trees, the PRESIDENT hoped the London County Council would ordain that the wider thoroughfares of the Metropolis should be treated in a similar manner. There was, he said, hardly a more beautiful tree in existence than the plane, and no place in which it flourished better than in London. In his opinion it was a great mistake to suppose that trees in most cases hid a building to its detriment; by their contrasting forms they heightened its effect both in summer and winter. Turning again to the Exhibition, he personally was most interested in the Trocadero Palace, which was not, strictly speaking, part of the year's Show: the western wing contained the Exposition-Rétrospective of French art-workmanship, while the museum of architectural sculpture occupied the whole of the eastern. That wing was completely furnished already with casts of all that was most interesting in the way of architectural sculpture in France, from Gallo-Roman times to the Renaissance; while occasionally, side by side (with apparent intention) were placed casts of sculpture of different ages or from different provinces when it seemed specially interesting to invite comparison. That most fascinating collection owed much, if not everything, to the enthusiasm and learning of VIOLLET-LE-DUC, and to the veneration in which his name was held by those who had known him and who could appreciate his value. To do him honour that Museum of Comparative Sculpture had been instituted on the lines which VIOLLET-LE-DUC had himself indicated,—to show France's gratitude to the man who, more than any other, during forty years, "raised up, restored, brought back to life "and light," by his labours and his genius, the incomparable historical monuments to be found in every part of France. The PRESIDENT thought it perhaps useless to hope that the British Government would follow the example set them in France, and create a similar educational museum, especially as at South Kensington there were two galleries containing a variety of plaster copies of celebrated monuments. Alluding to the subject called by M. CÉSAR DALY *Les Hautes-Études d'Architecture*, the PRESIDENT expressed his entire sympathy with that author's enthusiasm; and agreed that by a philosophical

study of the relation of architecture to life in the past, and a knowledge of the needs of the present, architects would ultimately learn to discriminate between what in bygone art was based on constant laws, applicable to all time, and what was ephemeral in its nature, and had consequently no claim on the attention of practical artists.

The President next referred to Mr. Leonard Stokes's Address as President of the Architectural Association, and commended Mr. Stokes's utterances on the subject of professional education, in which he maintained that the Institute and the Association should work more together to prepare for Examinations as well as hold them. That in this country there was no single or complete and unalterable course of education, he thought was not to be regretted. There were, however, certain matters that were essential; and how these were to be secured, and what institutions existed to aid the student, he proceeded to state. The Royal Institute was not, and had never been intended to be, a teaching body; it held no classes, gave no formal instruction, and had no professors, as such, upon its staff. At the same time it did definitely promote and encourage, or, to use the words of the Charter, it "furthered" the systematic education of the young architect—(1) by its system of examinations; (2) by its annual prizes and awards; and (3) by its Library. The Royal Institute, also, admitted no architect or architect-student to the position of Associate (A.R.I.B.A.) until he had satisfied its Board of Examiners that he had acquired a satisfactory basis of education in all the important parts of professional knowledge. The Syllabus gave every necessary particular of the Examinations, together with lists of the chief literary and artistic works which should be consulted. The Final Examination was a searching one, written, graphic, and oral; while the Council had now put in force the Preliminary and Intermediate Examinations, and published advice as to preparation for them. By the various medals, studentships, and other prizes, students were incited to study and to work; and a not unimportant item was the annual exhibition of the drawings submitted for these prizes and of the work done by the Travelling Students. The Library, which was free not only to members of the Institute and of the Association, but also to all *bonâ fide* students of architecture, contained,—besides all the more famous books and educational treatises on architecture,—a valuable Loan Collection, so that readers could take many works away for home study. The Academy school, the lectures at King's College and University College, and the classes on Scientific Masonry at the City and Guilds of London Institute, were then referred to by the President.

From what he had stated Mr. WATERHOUSE thought the student of architecture need not now be under any difficulty in ascertaining what was the least he ought to know, nor how he could with diligence acquire the requisite knowledge. But in describing most of the advantages a London student enjoyed, he had said little about the methods of teaching adopted by the Architectural Association, which had had, in his opinion, remarkable results, due principally to voluntary effort. Too much, however, was attempted by the Association, considering the comparatively limited time which could be given to each subject by the pupils and the visitors. Omitting the Elementary Division, the Advanced Division consisted of nine classes of instruction with six courses of lectures; and it was not surprising that the opinion, and if necessary the help, of the Senior Body should be asked for. Some few individuals cried out for a College to be raised and endowed by voluntary subscriptions; but he was not at all certain that it would be an unmixed blessing. Thoughtful critics among Continental architects agreed that there was something in the freedom of English study and practice which was at the bottom of the good results they had been willing to credit Englishmen with, and he submitted that the sooner the student was left to his own devices the sooner he would develop his inventive faculty and artistic judgment.

Having referred to the fact that this was the only great country in Europe which did not utilise its national buildings and monuments for educational purposes, Mr. WATERHOUSE stated that in England there existed no Board analogous to the French "Council-General for Civil Buildings," the members of which still met twice a week in Paris, and had done so for the past 225 years. The PRESIDENT considered that a similar Building Council, appointed by the Government and partly composed of professional architects, was wanted in London, while a special tribunal for the consideration and settlement of building cases was also required, so that in some cases—such as structures of abnormal height—the law might step in to prevent individual action when it affected the senses of the public prejudicially. In default of a proper authority, the Royal Institute had done what it could, and not without some satisfactory results, as, for instance, in the question of the site for the National Portrait Gallery and the preservation of the church of St. Mary-le-Strand.

The great measure of Local Government passed during the Parliamentary Session 1887–88 would, the PRESIDENT considered, have increased the boon it had conferred on the nation had it included provisions for testing the qualifications of architectural, engineering, and building officers appointed

under the new Act, as in the case of district surveyors under the Metropolitan Building Act 1855. It was incumbent on the Government to enforce the technical examination of candidates for all such offices.

In conclusion, the President, having called attention to the Birmingham Assize Courts as showing that there was once more alive in England pure inventive art, which clothed the building with details of exquisite beauty, dictated by necessity, and designed to meet the peculiarities of the materials without slavish regard to precedent, said his impression was that they were surely advancing. The education of students was now based on something of a system, and there was among the productions of some architects a true artistic sense of the beautiful overlaying a desire for the fitness of their work as a means to a useful end. Never had there been a time when a higher tone existed in the profession, when the necessity for clean-handedness was more generally understood; and he saw nothing to prevent the profession achieving great results in the near future.

THE PRESENTATION OF PRIZES took place on Monday, 20th January 1890, when Mr. Waterhouse delivered an Address* to the students assembled. Having lately had fresh experience of the vital interest the subject of competitions possessed to most young architects, the President dealt chiefly with the recent competition for Municipal Buildings at Sheffield. He confessed that he should be glad to think the day was not far distant when competitions would be rarely, if ever, resorted to, except for works of the greatest national importance. He lamented their frequency, chiefly because of the enormous amount of unproductive labour they involved; but, at present, he saw no tendency towards their diminution. It was most important that those who were concerned as assessors in drafting instructions should see that they were so prepared as not only to secure the best results from the promoter's point of view, but, also, to subserve as much as possible the interests of the profession. Every competitor should be put as nearly as could be in the position of an architect acting for a private client, who, though

* This Address is printed in its entirety in *The R.I.B.A. Journal*, Vol. VI., pp. 121–26.

he might have suggested his requirements, would probably listen to his professional adviser if he gave good reasons for not adhering to them literally in all cases.

The President here gave some particulars as to the nature of the instructions issued for the Sheffield Municipal Buildings. All drawings were to be to $\frac{1}{16}$ scale, a condition which allowed of the stretchers being as small as 2 ft. by 1 ft. 6 in. Mottoes were not allowed, a numerical system being adopted for identification, and finally no alternative schemes were permitted. To this prohibition the President drew special attention, believing that as a rule those architects whose exuberant imagination would induce them to send in alternative schemes lost much time by so doing. They might show themselves men of varied resources, but hardly architects convinced of the perfection of their own scheme; the time spent in preparing two schemes would be much more profitably spent in perfecting one. He felt obliged, however, to mention an exception to the rule which occurred in a competition many years ago for the Bristol Assize Courts, at which he was the assessor, and when the late Edward W. Godwin carried off all the three premiums; but what so gifted an artist might venture upon with success, it was not given to everybody to imitate with a like result—and, as it was, the brilliant exploit failed to secure to Godwin the execution of the work.

At Sheffield, the accommodation required was supplied to the competitors in the form of a schedule, in which the sizes of rooms were only suggested sizes. A general compliance with the dimensions was all that was insisted upon. The total number of superficial feet of suggested accommodation was also given at the end of the schedule, the blank columns of which had to be filled in by each competitor, and also the total aggregate of his accommodation. The schedule, so filled in, had been of the greatest use in comparing the different designs. As usual, numberless letters were received from competitors on the subject of the instructions; and at a given time a copy of the printed replies to 121 questions was sent to every one who had obtained instructions, no further questions being answered. There were 178 designs submitted; and, although a few transgressed the instructions, on the whole the competition was to be looked upon as a great success. Among them was an unusually large number of good thoughtful designs, many showing an excellent originality; a considerable proportion, however, perhaps owing to the shape of the site, bore too great a resemblance to the Manchester Town Hall, which in some cases had been followed even in its faults. An elevation of the west front, 200 ft. in length, alone was asked for; and the height of

adjacent buildings did not appear to have been duly considered by every competitor, as that, the principal front of the Municipal Buildings, was in some cases drawn with a parapet not more than 45 ft. from the street level. This want of height had been generally made up for, either by a tower on a line with the front, by one set back behind the state apartments, or by a tower at one or other extremity of the front. These towers in many instances showed great ingenuity in their design; and he had dwelt upon some of them with tenderness and, when they had to be put aside, with sincere regret. In a few designs a dome took the place of a tower. Such massive features, however, did not in all cases stand on sufficiently massive supports; and, although most architects were occasionally tempted, or forced, to use iron or steel more freely than was desirable in support of walls, would it not be well, asked the President, to make a rule to dispense with any feature of a non-essential character in a monumental stone building, whenever its introduction demanded the use of iron girders and stancheons? Another frequent feature among the designs—like the tower, entirely optional—was the porte-cochère. Leave to introduce that feature was given in the printed replies, and by far the greater number of the competitors availed themselves of it; but, generally, not to the improvement of their elevations: to which fact he wished to draw special attention. By the great projection of the porte-cochère it hid the front from view if seen in quick perspective; by its height and projection it seriously dwarfed the elevation; or when, to avoid those disadvantages, it was kept very low, it looked mean. Lastly, its peculiarities of construction involved too often a want of harmony between it and the building it served. The best treatment he had seen was when the carriage-way went behind an open arcade which supported an advancing central gable; and where the wings of the façade also advanced, there was, he thought, much to be said for the arrangement. It was not, however, in favour at Sheffield, though in one case the carriage-way was carried within the walls of the building. In that competition, as was but too general, the anxiety to get all the accommodation of the suggested dimensions into his plan had often prevented the competitor from observing that his rooms had been made of a proportion which would be intolerable if carried out—*e.g.* 50 ft. by 30 ft. by 12 ft. 6 in. high; while many had their walls over voids, some of the chimney-stacks gave no account of themselves on upper floors, and staircases were shown which could never have been constructed.

Referring to the question of light, in the majority of cases the use to which the light from small areas had been put was the best possible—that

is, it was used to give side light to corridors, which, as they were seldom more than 7 or 8 ft. wide, could be lighted across their width much more easily than a room 30 ft. from back to front could be. The exceptional favour some competitors, however, expected from the sun filled him with amazement. For the sake of light, air, general cheerfulness, and architectural effect, internal areas in a building should be as few and as large as possible; for though it might increase the difficulty of lighting corridors, a skilful designer would contrive that they were never dark, especially at their extremities, where they turned, or where there was a change of level.

With regard to staircases, a principal flight of stairs in such a building could hardly with propriety have steps less than 6 or 8 ft. wide, with treads and risers 12 in. by 6 in., or better, 12½ in. or 13 in. by 5½ in.; and until so much ease of going and space in a single staircase had been secured, it would be folly to think of double flights in the same staircase. In one design additional charm had been obtained for such a single staircase, by allowing a business staircase to be separated from it merely by a stone screen or open arcade, so that one stair could be seen from the other.

Sanitary considerations made it imperative that closets should each be lighted with a separate window, and that the ante-room of approach should be lighted and ventilated otherwise than through the closets themselves, which was not always remembered by competing architects. One well-lighted and well-ventilated closet was worth half-a-dozen of the sort so frequently seen on competition plans.

The President considered that the design of the elevations especially was of a higher average than that which had distinguished some late competitions, and stated that the designs were all, excepting the six selected for the final competition, on exhibition at Sheffield; and that where the authors were willing, their names were attached to their drawings. In the case of the six, their sketches were to be hung side by side with their elaborated designs when completed. He believed that in many a competition the expenses to which members of the profession were put would be found to amount to many times the total of the successful candidate's commission; and that except for the educational benefit to be derived from having designed and elaborated the details of some important building, there was to the body of the candidates very little profit gained from a system which most architects deplored, but did not see how to supersede.

No. 9, Conduit Street, Hanover Square, London, W.

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LXV.

THE APPLICATION OF IRON AND STEEL TO BUILDING PURPOSES. By F. T. Reade, Assoc.-M.Inst.C.E., *Hon. Associate.*

Mr. J. Macvicar Anderson, *Vice-President,* in the Chair.

Mr. Vice-President and Gentlemen,—

In this Paper I have thought that, to be thoroughly understood, it would be better to begin at almost the earliest branches of the subject; so, should you find, as doubtless many of you will, that the first part of the Paper is somewhat elementary in character, perhaps you will hold me excused when you reflect that there are younger members of your profession whose experience of iron construction may be limited, and to whom even this elementary information may be useful.

To make the Paper complete and exhaustive, one would require more than a single evening for its reading and discussion; so I have endeavoured, in the limited time afforded me, to give such information on the subject as would enable any one of you to treat, in a practical and economical manner, any ordinary question of iron construction, such as occurs in your everyday practice, requiring to be determined offhand, and for which the assistance of a specialist in iron construction is unnecessary.

The results you will arrive at by so treating them will not necessarily be theoretically accurate, but will be sufficiently correct for all practical purposes.

Engineering has been defined "as the application of common sense to the use "of materials in construction," and the definition is to a great extent a true one; for the present Paper it may be assumed to be absolutely exact, and I therefore propose, as far as possible, to use nothing but simple arithmetical calculations, and be guided by common sense in the adoption of the various sections and materials mentioned in the Paper.

Foundations and Piers.—As the greater part of the questions to be discussed have to do with weights to be supported by columns and girders, it would seem to be proper to begin with the subject of piers and foundations; and, in the first place, to take a common-sense view of the material on which these rest. It requires no demonstration

of the fact that, if we take two 12-inch cubes of stone, placing one block on soft clay or sand, and the other on hard clay or undisturbed gravel, and load both of them with two tons, the one on the soft clay or sand will sink down, while the one on the denser material will only sink to an inappreciable extent; consequently, the first thing to be observed is the character of the earth on which we propose to build, and then to form a practical opinion as to the load per foot superficial which it would be safe to put upon it, making the base of the foundations of such area that the limit of pressure shall not be exceeded.

It would be out of place, in such a short Paper as this, to attempt any description of the earth's various strata or the deposits thereon; but it may be roughly stated that the safe loads which may be put on foundations vary from one ton per foot superficial for made ground to three tons per foot for very hard undisturbed gravel or clay; and we may assume, therefore, that, for the average of good foundations, two tons per square foot of superficial area is a good working value. Professor Rankine [*Civil Engineering*, page 380] gives only 22 to 32 cwt. per foot; but as in most buildings a large percentage of the load is due to floors which are only partially loaded, the above may be assumed to be quite safe. Some experiments made during the construction of the foundations of the New Capitol at Albany, New York, showed that a load of two tons per square foot was a safe load on blue clay [*Proceedings of the Institution of Civil Engineers*, vol. lvii. pp. 198–207]. In preparing for the foundations of the Eiffel Tower, it was found that the bed of clay at that spot was capable of supporting a load varying from $2\frac{3}{4}$ tons to $3\frac{1}{2}$ tons per square foot, and for some of the Forth Bridge piers a load of 6 tons per foot was taken as the limit of pressure on very hard clay, at a depth of about 70 feet.

Having settled on a limit of pressure on the earth, take an isolated column as being the simplest case, and assume that it carries a not unusual load of 50 tons; such a column would weigh about 15 cwt., say one ton; thus 51 tons will be discharged on its bed stone. This bed stone may be taken as ordinary sandstone, which would carry with safety a load of 25 tons per foot; this determines the size of the base flange of the column, which in this case should have an area of 2 feet at least.

A base flange $20'' \times 20''$ gives 400 inches area, and deducting from this 50 inches for the area of the core and 5-inch corners cut off each angle, we get $2\frac{1}{3}$ feet area of bearing on the bed stone. In a building where the ground-floor supports are principally columns, and especially for a corner shop where there is only a party and back wall, it is advisable to make the column or stancheon bases larger than given by the above rule: to give lateral steadiness to the building.

The size of the column base will also depend upon whether a brick foundation is required or not. It may be assumed that a practical limit for the size of a reliable base stone is about $4' \times 4' \times 24''$. When the load requires a larger stone than this, it is better, and not more costly, to fix the column on a large cast-iron base plate, bedded directly on the concrete or upon intermediate footing-courses of brickwork.

The concrete block under the bed stone or base plate or brick pier should always

be mixed with Portland cement, for the ordinary lime concrete is long in setting, and in large masses it will take years before the centre of the block becomes hard.

A concrete mixture of one of Portland cement to eight of other ingredients, if carefully and well mixed, will safely bear a load of 5 tons per superficial foot. These other ingredients should be *hard* materials, as gravel, broken stone and bricks, or bats of hard quality. Assuming such to be used, we should require an area of bed stone of about 10 feet to distribute the load of 51 tons. $3' \ 3'' \times 3' \ 3''$ gives $10\frac{1}{2}$ feet superficial. The thickness of the stone now remains to be determined.

If the thickness be made $1\frac{1}{2}$ times the projection of the stone beyond the column base, the base stone will be strong enough. In the present instance, the column base is 20 inches, and the bed stone 39 inches, or $9\frac{1}{2}$ inches projection each side: $1\frac{1}{2}'' \times 9\frac{1}{2}'' = 14\frac{1}{4}''$, say 15 inches. The stone will weigh about one ton, so there are now 52 tons on the concrete. The limit of pressure on the earth being 2 tons per foot, the concrete should have an area of 26 feet, and, assuming that it would not exceed 2 feet in thickness, its weight would be under 3 tons, or say 55 tons on the earth; $5' \ 3'' \times 5' \ 3''$ gives $27\frac{1}{2}$ feet area, or 2 tons per foot. The thickness of the concrete should be about twice its projection on each side beyond the stone; in the present instance, the stone is 39 inches and the concrete 63 inches, or 12 inches projection each side: $2'' \times 12'' = 24''$ thickness of concrete. Under some circumstances it might be more convenient that the column above described might have its base at the ground-floor level with a brick pier under it brought up from the basement. The size of such a pier would be determined by the material of which it was built, and the quality of these materials; and if of brickwork, which is most usual, such brickwork should be built with cement, and not ordinary mortar. The limits of pressure on brick piers vary from 5 tons per foot for ordinary stocks in mortar to 12 tons per foot for hard bricks in cement.

The 14-inch basement wall in the Great Titchfield Street accident bulged and collapsed under a load of $18\frac{1}{2}$ tons per square foot; and I may mention another instance that came under my inspection, where a pier about $40\frac{1}{2}'' \times 36''$ (built about 12 months in ordinary mortar) began to show signs of failure (under a load of about 82 tons) by the splitting of the bed stone and a crack in the brickwork; the external face of the brickwork appeared perfectly sound, and the mortar in the joints was very hard; but, as the building appeared evidently unsafe, it was at last determined to underpin it, take out this pier, and rebuild it. This was done; and, when the pier was cut into, it was found that at $4\frac{1}{2}$ inches from the face the mortar was perfectly soft, and had no more consistency than garden mould, crumbling easily between the fingers, so that the pier was in the condition of a box or shell of sound brickwork $4\frac{1}{2}$ inches thick, with its interior filled with loose bricks bedded in sand. It was rebuilt in cement.

On good hard brickwork in cement a load of 12 tons per foot superficial may be carried; the load, as before, is 51 tons; $\frac{51}{12} = 4\frac{1}{4}$ feet superficial. This would require a pier about 2 feet square; but, as this is not a brick dimension, we take $1' \ 10\frac{1}{2}'' \times 2' \ 3'' = 2\frac{1}{4}'$ nearly. If this should be an entirely isolated pier, with no wall running into it, it had better be made $27'' \times 27''$, total height not exceeding about 10 feet.

The bed stone under the column base can now be made smaller, as it has only to distribute the load of 51 tons on a material capable of carrying 12 tons per foot instead of 5, requiring only about 4 feet area. A little less than this would suffice, as the stone need only extend to 2 inches from the outside edges of the pier, so that all joints of brickwork are well covered by it.

Supposing the basement to be 9 feet high, and the pier say 12 inches below the basement floor, there are 50 cubic feet of brickwork or $2\frac{1}{2}$ tons to add to the load on concrete, and the footings at the base of the pier should be spread until an area of $\frac{53\frac{1}{2}}{5} = 10\frac{1}{2}$ feet superficial is obtained. 3′ 3″ × 3′ 3″ gives the area required, which means that three courses of footings are necessary all round the pier, and it is advisable that the bottom course on the concrete should be a double one—6 inches deep. The load on the earth being very little in excess of the previous one, let the concrete be 5′ 4″ × 5′ 4″ and 24 inches thick.

From the above it will be seen that the reason for the use of bed stones, brick footings, and concrete, is simply to increase the area of the bearing at each level, where the change of the materials used requires that the intensity of the pressure per superficial foot should be reduced; thus it would be quite possible to build safely on a very soft earth, or even stiff mud, provided that the area and thickness of the concrete foundations are proportioned to correspond to a low limit of pressure per superficial foot; but in every case care should be taken that the intensity of the pressure is uniform over the whole area, and, where lightly-loaded walls occur, to put correspondingly small footings and foundation, for the excess of foundation area in such walls is a great source of cracks and settlements in buildings.

Cast-iron Columns and Stancheons.—A column, strut, or stancheon may be in any one of three conditions—either fixed at both ends, or hinged at both ends; or hinged at one end, and fixed at the other. The first of these conditions rarely occurs; the second does not often happen, except in the case of roof-truss struts, and the diagonals or verticals of lattice girders; the third condition is the most common. It generally happens that in any stack of columns or stancheons, only the lowest can be considered as perfectly fixed at one end, this end being—of course—its base; at the floor immediately above this, it may be held in at least three directions by girders and rolled joists, the connections of these to the column head being made by bolts, which may, or may not (probably *not*), be fitted with accuracy; it is usual to consider such a column as being fixed at one end, and hinged at the other. For the columns above the lowest it usually happens that *both* ends are imperfectly fixed, as above described; it would clearly be incorrect to assume that such a column had both ends *hinged*, so the calculations are usually made on the assumption that one end only is fixed.

The mode of calculating the strength of such columns and stancheons, according to Gordon's formula, as given by Professor Rankine, is here stated. The results of this formula will not be correct in the case of a very short column whose length is less

than twelve times its diameter, for the formula is founded upon the supposition that all columns fail by bending, whereas it is clear that such a short column would fail more by crushing than by bending.* A cast-iron hollow column to carry 50 tons should have a ratio of about fifteen to twenty times its diameter for its length. This might safely be loaded to $2\frac{1}{2}$ tons per square inch of sectional area; and, assuming a diameter of 9 inches and a thickness of metal of one inch, the area will be 25 inches, or 20 per cent. in excess of the requirements; but for hollow columns it is always advisable to have a liberal margin of safety, as, unless great care is taken in the moulding, the shifting of the core may cause an unequal thickness of metal in the casting.

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* The formula most generally accepted at the present day is that first devised by Professor Lewis Gordon, on the basis of Hodgkinson's experiments, and subsequently generalised by Professor Rankine.

Let W = breaking load of pillar in tons per sq. inch;
L = length of pillar in inches;
d = width or diameter of its cross section in inches;
F = constant depending upon the material;
C = constant depending upon form of cross section.

Then:—

Columns fixed at each end . . . . $W = \dfrac{F}{1 + C \times \left(\frac{L}{d}\right)^2}$.

Columns fixed at one end and hinged at other end . . $W = \dfrac{F}{1 + 2\,C \times \left(\frac{L}{d}\right)^2}$.

Columns hinged at each end . . . . $W = \dfrac{F}{1 + 4\,C \times \left(\frac{L}{d}\right)^2}$.

Where for wrought-iron, F = 16 tons per sq. inch,
Cast-iron, F = 36 tons „ „

For different forms of cross section, the constant C has the values given in the following table, it being assumed that the thickness of metal is small compared with the dimension d.

	C = Cast-iron	C = Wrought-iron
Solid square	$\frac{3}{1,600}$	$\frac{1}{3,000}$
Solid circle	$\frac{1}{400}$	$\frac{1}{2,250}$
Hollow square	$\frac{3}{3,200}$	$\frac{1}{6,000}$
Hollow circle	$\frac{1}{800}$	$\frac{1}{4,500}$
Cross, equal arms	$\frac{3}{800}$	$\frac{1}{1,500}$
Girder section (to bending in line of web)	$\frac{9}{11,200}$	$\frac{1}{7,000}$
Girder section (to bending in direction of flanges)	$\frac{9}{3,200}$	$\frac{}{2,000}$
Narrow girder section (in direction of flanges)	$\frac{3}{800}$	$\frac{1}{1,500}$

F. T. R.

Also, there are practical difficulties in connection with moulding, which, for columns of about this length, make any less thickness than one inch likely to produce an unsound casting.

The hollow column is theoretically the strongest form of section, but the probability of an unequal thickness of metal is an objection to its use ; this may be guarded against, to a certain extent, by specifying that some of the columns shall have small holes drilled in their shafts to ascertain the thickness, and that, where the metal on opposite sides differs more than one-fifth of the proper thickness, such columns shall be broken up. To show that great variation in thickness is not an imaginary danger, I may mention that, on one occasion, while inspecting a number of columns, and while waiting for a hammer to be brought for the purpose of sounding them, I idly prodded one of the shafts with my umbrella, when, to my intense surprise, at the third prod the point of the umbrella penetrated the shaft of the column. Of course it was at once broken up, and it was found that, instead of being of the proper uniform thickness of $1\frac{1}{8}$, it was nearly 2 inches thick on one side, and about the thickness of a sheet of paper at the part where I so luckily prodded it. Another objection to the form of the hollow column is that it does not lend itself very readily to being cased in a fireproof material. The present example may be assumed to be a hollow column.

The size of its base flange has been already given, and it should have a bold rounding at its junction with the shaft, and be bracketed in four directions; the thickness of the base flange should be from one-eighth to one-quarter more than the thickness of the shaft—in this case $1\frac{1}{4}$ inch.

The base flange should be as near as possible at right angles with the axis of the columns, which can only be obtained by turning in a lathe; but it is not usual to turn the surface of a base flange resting on stone, the more common plan being to level the stone accurately, then place the column in position, and wedge it up at the four corners until it is about $\frac{1}{2}''$ to $\frac{3}{4}''$ clear of the bed stone, and its shaft quite vertical. A clay dam is then made on the bed stone, and the vacant $\frac{1}{2}''$ or $\frac{3}{4}''$ space run with pure cement mixed with a very little fine, sharp, dry sand; when set, wedges are drawn and their spaces filled up. In ordinary construction, where columns stand one above another, they are usually made with flanged junctions turned on face and bolted together; but in some special cases, such as in theatres and similar buildings, they are made with long socket or spigot and faucet junctions, and sometimes the junction is covered by a sleeve casting, on which the attachments for girders and bracings are made by lugs cast on the sleeve-piece.

The latter junctions offer great facilities for fixing, but they are more expensive than a flanged junction; and as the sleeve-piece and socket have to be bored and the spigots turned all very accurately to gauge, it follows that this class of work can only be done well by the best firms, who have special machinery and apparatus for producing it.

Where columns and stancheons stand one above another through several floors, it is nearly always advisable that the columns or stancheons should be continuous; but

in some instances, where the greater part of the load above the first or the second floor is taken by a main girder at those levels, and the load on the column above that floor is comparatively light, it may be advisable to put the column base of the upper columns on the top of the girder [fig. 1].

A hollow column has been taken for the example, as the use of solid columns is very limited, and they are rarely made more than 4 or 5 inches diameter, owing to the fact that the metal in cooling sets hard quickly on its outer circumference before the centre of its section has time to solidify. This part of the section can no longer contract freely in cooling, and becomes spongy and porous when finally set; there are also initial stresses set up in the material of the column itself, during the process of cooling, which in a column of large diameter would be highly dangerous.

Considering the above objection, and also the fact that, when there are tiers of columns one above another, the junctions of the girders resting on them are difficult to arrange properly, it will generally be found that stancheons of the ┼ or H shapes are preferable. They have the great advantage, that the whole surface of the metal can be seen, and any imperfections detected; also the absence of the central core greatly reduces the risk of an unsound casting, while in tiers or stacks of stancheons such sections give great facilities for making simple junctions of girders and iron joists at the various floor levels. Some examples of junctions of girders, rolled-iron joists, and stancheons and columns, are given [Illustns. i, ii].

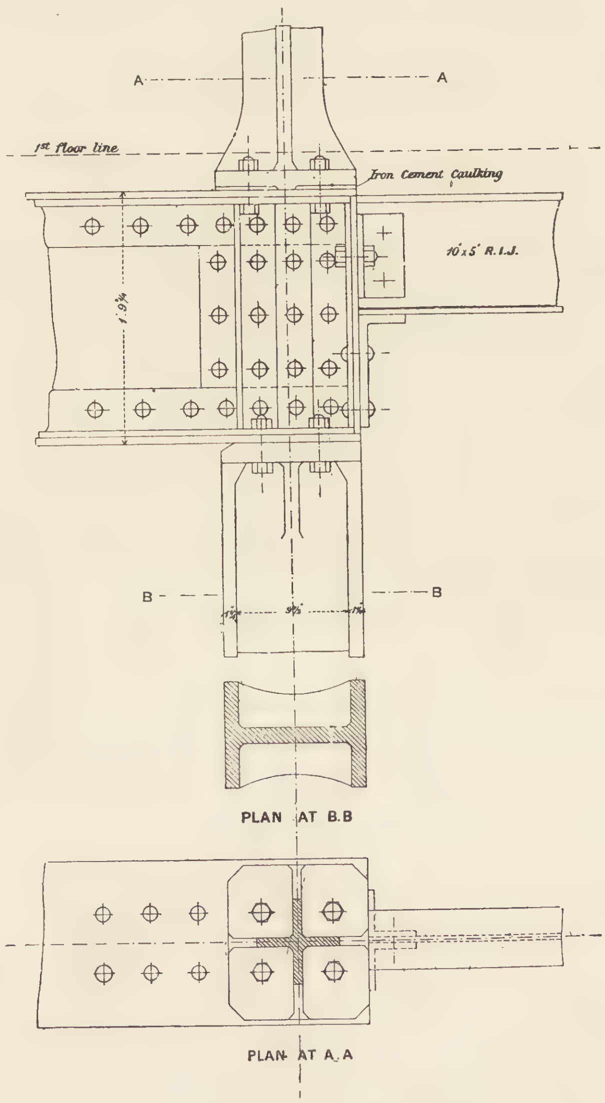

Fig. 1.—A Stancheon on Top of Girder.

These stancheons are easily encased in concrete or other fireproof material; and finally, where the loads differ greatly on opposite sides of the stancheon, they give an

opportunity of increasing the area of section on the most heavily-loaded side, by widening the flange under that load, or by slightly increasing the thickness of metal there—though this must always be done with caution, as any great variation of thickness in a casting should be carefully avoided, or, if actually indispensable, such variation should be gradual, and not abruptly made. Supposing that, for the column already described, it is proposed to substitute a + section with equal arms: it would be advisable to make the diameter or width rather more than in the case of the hollow column—say $\frac{1}{15}$ of its length, or about 12 inches. This section of $1\frac{1}{4}''$ metal would give an area of 29 inches; its base would be the same size as the column base, and bracketed in the same way: at the intersection of the arms of the cross, there would be a deep angle corner, and at about 3-feet intervals in the height, circular diaphragm plates 11″ diameter and 1″ thick. If the H section is preferable, it is generally made of unequal dimensions (say 12″ × 9″), and if of 1″ metal, it would be of about equal strength to the column and stancheon already described; it also should have diaphragms across section at about 3-feet intervals. The limits of stress per square inch for both the above sections would be 2 tons.

These sections are sometimes lightened by having openings cast in the web; but this is not to be recommended except in some special cases. The reasons that influence the selection of a cross or H section are generally connected with the arrangement of the bearings of the girders carried on top, and will be explained later.

In designing a stancheon of H section to be placed flat against a wall, it must be remembered that the least width of its section, viz., the width of the flanges of the H section, is the measure of its strength, and it will be seen at once that an H section, 12″ × 6″, is not so strong as one 12″ × 9″, even though it contained the same sectional area. The commonly employed ⊓ or m section is not to be recommended, on account of the very unequal distribution of compressive stress over its section, and also on account of its liability to become bowed in cooling—a risk which, more or less, attends all very non-symmetrical sections.

These channel sections are generally fixed, with the web or back placed against the wall; but the stancheon is under better conditions if the web is placed outwards towards the centre of span.

In the case of a girder carrying upper floors over a shop-front, it is one of the requisitions of the Metropolitan Building Act that stancheons should be placed each side of the end of the party-wall between the shops; and as the glass space in shop-fronts is of great importance, it is necessary to keep such a stancheon as narrow as possible on the shop-front face. Where the shops adjoining have the same ownership, it would be better, instead of putting two stancheons, one each side of a party-wall, to put one stancheon to carry both fronts, which could generally be got in in the thickness of the party-wall, and thus not project in the window space at all.

Where it is indispensable that the stancheon shall be very narrow in one direction—say that the web should be twice the width of the flanges—it will be necessary to take a lower limit of stress per inch of section, thus

2	tons per inch when length	= 15	times the least width;		
$1\frac{1}{3}$	,,	,,	22	,,	,,
$\frac{3}{4}$	,,	,,	30	,,	,,

Whatever form of section of column or stancheon is decided on, it is important that the cap plate on which the girder rests should be well chamfered back from the front to prevent the girder from bearing on the extreme front edge of the cap plate; and, in the case of very narrow stancheons, the cap plate should also be narrow to prevent as far as possible the deflection of the girder tending to bend the stancheon, while the base should be as wide as possible in each direction, and be well bracketed.

All bed stones for ends of girders in walls should have their front edges chamfered in the same manner, and for a distance of three inches from the face.

Wrought Iron and Steel Stancheons.—It is not now uncommon to use stancheons made of rolled joists, the cap and base plate being fixed to the joists by angle-irons or gusset plates, or both combined. As the ends of joists cannot be considered as bearing accurately on the end plates, without special care in the workmanship, such gussets and angles must be designed so that the shearing or bearing resistance of the riveting alone is sufficient to transmit the load to the base flange [fig. 2].

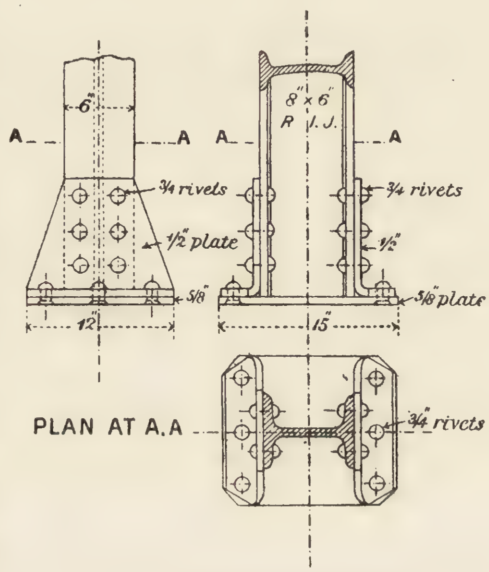

Fig. 2.—Wrought-iron Stancheons.

If the stancheon is made of an 8″ × 6″ joist, it may be safely used up to 12 feet long for a load not exceeding 25 tons; or, the area being 9 inches, say $2\frac{3}{4}$ tons per inch. The limit of shearing stress of wrought-iron being taken at 5 tons per inch, we should require about 5 inches of area in the rivets connecting the gusset plates to joist flanges; if we use $\frac{3}{4}''$-rivets having an area of ·44 each, then $\frac{5}{\cdot 44} = 11{\cdot}36$, say 12 rivets in single shear, would be required to connect the joist to the base flange.

The above rough-and-ready approximations are perfectly reliable up to 60 tons, and are not extravagant in material; where greater loads are in question, and where, from certain limitations in sizes of stancheons, their shape is not regular, and in columns whose ratio of length is, say, 30 times their diameter, more careful calculations are necessary.

For very heavy loads, say 150 to 300 tons, it is usual to make stancheons of wrought iron, of tubular section, with web plates and angle-irons, or with webs made of rolled joists or channel-irons. The construction of such stancheons presents many special difficulties of design in the cap and base junctions; and as such loads rarely occur in

ordinary practice, it is advisable, whenever they do occur, that an engineer should be employed to design them.

Wrought-iron stancheons of H section, where loads are light, are sometimes made with cast-iron flanged end sockets, the joist being dropped into the sockets, and wedged in with steel wedges, or caulked with iron cement.

Steel is sometimes used for stancheons of sections as above described, made of channel sections with angle flanges forming an octagon, or ribbed circle when riveted up, or of four angles riveted back to back forming a cross section.

Where the diameter of the stancheon is not limited, and for loads under 100 tons, there is no advantage to be gained by the use of steel; but for very heavy loads, or where length of stancheon is great in proportion to diameter, or where the diameter has to be made as small as possible, this material may be used with great advantage.

According to the Reports of the Iron and Steel Institute, some firms in Germany and Belgium are about to produce cross-sections in steel, with arms from 8″ to 16″ across, and from $\frac{1}{2}$″ to $1\frac{1}{4}$″ in thickness, for special use as stancheons, to be fitted into cast-iron caps and bases. In some cases such a section would be very useful; but, except where a girder can bear directly on the top of the cast-iron cap, it would seem that girder bearings or brackets riveted on the arms of the cross below the cap would prove somewhat expensive.

It would no doubt be possible to produce a cast-iron or cast-steel head with attachments for girders cast on it; but, as the section is not yet available for use, further consideration of the subject will not be of much advantage.

Cast-iron base plates direct on concrete are rarely used, unless the load on the column exceeds 100 tons. It is not possible to give a rule for their depth in the centre, or the thickness of metal, as this will be influenced by the number of the radiating arms and their thickness; but a rough approximation would be $2\frac{1}{2}$ inches in depth for every foot in diameter, and a nearly uniform thickness to that of the column or stancheon on it. Thus, a base plate 6 feet diameter would be about 15 inches deep in the centre, and as the stancheon on it would have to carry a load of 130 tons, it would be found to work out to about $1\frac{3}{4}$″ metal, and the base plate should have the same thickness. Such a base should have some holes about 3″ diameter cast in the spaces between each pair of radiating arms, so that when the base plate is wedged up, and cement is run under the same, it can be seen to flow at these holes, and thus make certain that the whole area of the plate is covered by cement. The junction of these plates with stancheons must always be turned, and the connection made by six or eight $1\frac{1}{8}$″ or $1\frac{1}{4}$″ bolts, as the plan of the stancheon permits.

Cast-iron Girders.—The first things to be determined, in designing a girder of any material, are its span, its load or loads, and its depth.

The span of a girder—for calculation—is not the distance between the supporting walls or piers or columns, but the distance between the centres of the bearings of the girder; thus, supposing the distance between the walls is 20 feet, and the girder has a 16″ bearing at each end, the span for calculation will be 21′ 4″.

The load or loads may be placed on the girder in an infinite variety of ways, and may be a dead weight of solid brick- or stonework, or a combined load of brick wall with one or more floors discharging on the same. For a dwelling-house or an office-building with wooden floors, the actual weight of the floor and ceilings will vary, according to span and mode of construction adopted, from 14 to 21 lbs. per foot superficial; and as the weight of a crowd of people standing closely packed does not exceed 84 lbs. per foot superficial, a load of 1 cwt. per foot superficial is ample in these cases; in fact, for ordinary dwelling-houses, $\frac{3}{4}$ cwt. would suffice; for even supposing the load was increased to 1 cwt. per foot on any emergency, such as an auction sale, the stress on the girder per square inch of section would only be increased one-third, which, if the stress limit were originally taken at 5 tons per inch, would make the exceptional stress only $6\frac{2}{3}$ tons per inch, which would be well within a safe limit. For warehouses and similar buildings, the weight per foot to be adopted for the load on floors depends entirely on the nature of the goods intended to be stored in them, the weight per foot cube of the goods to be stored, and the height to which they are intended to be piled. This should always be ascertained by experiment, before the load to be carried by the floors is decided upon. The load per foot superficial will vary from $1\frac{1}{4}$ cwt. for furniture to 5 cwt. for paper, which may be considered to be about the heaviest stock, as heavy iron and metal goods are generally put on a ground-floor specially constructed. A simple example of the above would be the street front of a large shop; and to find the load on the first floor front girder it is only necessary to take the area of brickwork, and multiply by the thickness, first deducting all window openings, and adding the floor loads, if the joists discharge on the front, subject to the modifications mentioned above. It is not necessary to give an example of such a simple process, and the more complicated cases of combined concentrated and distributed loads, and loads partially distributed, cannot be brought within the limits of this Paper.

The depth now remains to be fixed, and this may have such a proportion to the span as to be either very costly or have an excess of deflection. Common sense would lead us to avoid using a very shallow girder which would deflect with its own weight alone; yet nothing is commoner than for architects to propose to use a girder about 24′ span, which must be concealed in the thickness of a 12″ floor. For any example likely to occur in an architect's ordinary practice in houses or offices, and within the limits of $\frac{1}{12}$ to $\frac{1}{20}$ of the span, a girder will neither be very expensive, nor have undue deflection; but within those limits, the deeper the girder, the more economical will be its section. The depth of a girder for calculation is not the depth over the flanges, but the depth between the centres of their sectional areas; and in ordinary girders, composed of angle-irons and plate flanges, it is usual to consider the depth of the web, or the distance between the flanges inside, as the depth for calculation.

The method of fixing the span, load, and depth of a girder having been given, the material of which it is to be made has then to be decided; and we will first consider cast-iron.

Cast-iron girders are now so rarely used that it will not be necessary to devote much time to their consideration; they should never be used for great or variable loads, and their proportion of depth to span should rarely be less than $\frac{1}{12}$. They may be used with advantage to carry window-backs and a single bay of a floor between stancheons placed 10 to 12 feet apart. An example of such a girder at 12 feet span, and carrying a 9-inch window-back, and an ordinary floor, would have a total distributed load of say 6 tons. The ordinary formula for a distributed load, $\frac{w \times l}{8}$ = bending moment in centre, is applicable in the present case, w being load distributed = 6 tons, l length in feet = 12: then $\frac{6 \times 12}{8} = 9$ foot tons. Cast-iron not being a very reliable material in tension, and its ultimate tensile strength only averaging about $7\frac{1}{2}$ tons per square inch, we take a factor of safety of $5 = \frac{7\frac{1}{2}}{5} = 1\frac{1}{2}$ ton per inch, limit of stress on bottom flanges. Assuming a total depth of 12 inches for the girder, the depth between centres of flanges will be about 11 inches; now, as the depth is in *inches*, the span must also be given in inches, and the bending moment in centre becomes 9 foot tons $\times$ 12 = 108 inch tons. Then dividing the bending moment in inch tons, by the depth in inches multiplied by the limit of stress, we get $\frac{108}{11 \times 1\frac{1}{2}} = 6\frac{1}{2}$ inches, nearly, for the area of the bottom flange. As cast-iron will bear a much higher intensity of stress in compression than in tension, the top flange need only have an area of about one-fourth of the bottom flange; but this condition can be rarely complied with, as, for structural reasons, it often happens that the top flange must be wider than the bottom one. As the present example is supposed to be carrying, as part of its load, a 9-inch brick window-back, its width should be not less than 7″, and theoretically would do ¼″ thick. For reasons already stated in the description of cast-iron stancheons, it is unsafe to have much difference in the thickness of the various members of any casting.

If the theoretical condition above stated was adopted and the bottom flange made, say, ⅜″ thick, its width would be 17″, which is a thoroughly impracticable section. If, for structural reasons, the width of the bottom flange is 6½″, to get the area required its thickness should be 1″, the web might be ⅞″ at bottom, and ¾″ at top, and the top flange, say, 7″ $\times$ ¾″; this is about three times stronger than necessary, but the section has now become a safe and practicable one.

Vertical ribs or stiffeners should be put between top and bottom flanges about 36″ apart; and, as the material gives facilities for treating these ornamentally, they can be moulded on the face and at the ends. The ends of the girder can be easily cast so as to make a neatly-fitting junction with the stancheon, and in a way almost impossible to treat in wrought-iron.

Such a girder as above described is a very useful form for carrying window-backs in interior light areas, where the window space is of importance; its bottom flange can

be made level with the ceiling, and a vertical rib cast on the underside of the bottom flange to form a reveal for the frame [fig. 3]. Such a girder being of uniform depth, the thickness or width of its flanges might theoretically be reduced towards the ends, but for such examples as are likely to occur in ordinary buildings it will scarcely ever pay to do this.

In the case of a large internal light area, with perhaps three or four lengths of girders along each side, and vertical stacks of stancheons between, it is better to make the girders rather shorter than the lengths between stancheons, and make up the space at ends by packings of the exact thickness required, so as to prevent the possibility of the stancheons being pushed out of the vertical line, to enable girders slightly too long, to be got into position, and save chipping their ends.

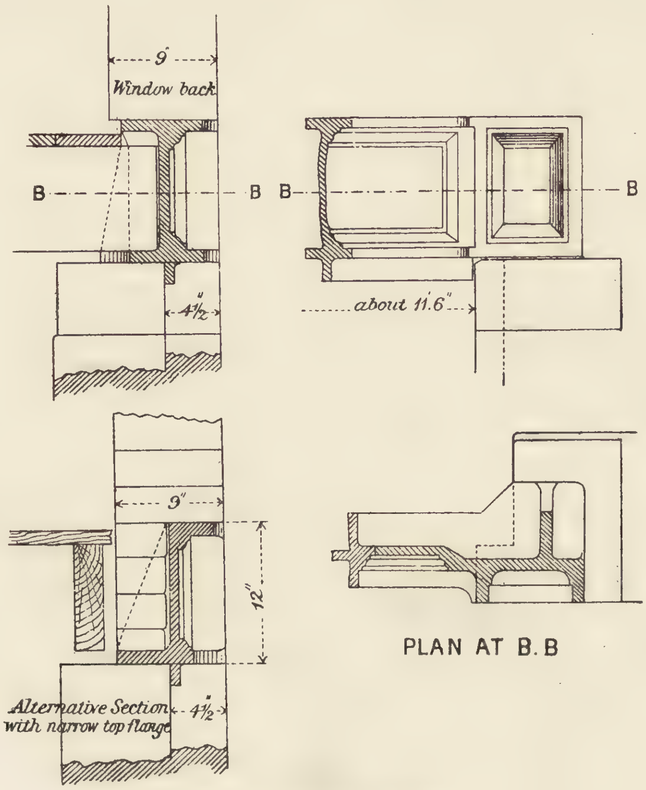

Fig. 3.—Cast-iron Girders.

Wrought-iron and Steel Rolled Joists.—In considering the question of wrought-iron girders, it will be best to begin with the simplest forms, which may be taken to be rolled-iron joists; and first, of such as are used to carry fireproof floors. As the modes of construction of such floors are almost infinite, and the subject would be too long for this Paper, the wrought-iron and steel joists carrying them will alone be considered.

In taking the opinion of fireproof-floor patentees as to the size of iron or steel joists they propose to use, it will be well not to adopt their proposals without inquiry; for, being anxious to show a cheap floor construction, some of them do not hesitate to employ iron joists of very small depth in proportion to span; in one such extreme case the depth proposed was only $\frac{1}{40}$ of the span. They claim that, as the top flange is imbedded in the concrete, the strength of the joist is thereby increased 50 per cent. It is increased in stiffness by the lateral support given to the top flange; and, where the joists are not very far apart, the concrete between them acts to a certain extent like the strutting in wooden floors. Thus, in the case of a concentrated load happening over one joist, the solid filling of concrete helps to distribute it over the two adjoining

ones; but, under the usual circumstances of a uniformly distributed load, this additional stiffness imparted to the top flange does not increase the ultimate strength of the joist, for the bottom flange being in tension, its strength is not increased by being bedded in the concrete.

It is not necessary now to describe the mode of calculating the strength of such sections; it is identical with that of girders described further on. Lists of their sections and safe loads are in the hands of most of the members of the Institute; but attention must be directed to the variation in the amounts of the safe loads given in these lists, by manufacturers and dealers in rolled joists. They very rarely give the limit of stress per inch on which such sections are calculated, and this accounts for the discrepancies which have doubtless been noticed between different lists, in which joists of identical sections have safe loads appended to them which in some cases vary nearly 25 per cent., the reason being that the smaller load has been calculated for a stress limit of 5 tons per inch, while those showing heavier loads have been taken on a limit of 6 or $6\frac{1}{2}$ tons per inch. These lists, in nearly all cases, only apply to wrought-iron joists; steel joists will safely carry 40 per cent. more load than that given in such tables for the same section of *iron* joist, with the important reservation, that the proportion of depth to span must be considered. If, for example, $6\frac{1}{4}'' \times 3\frac{1}{8}''$ wrought-iron joists at 14′ span, and 3′ apart, were used to carry a concrete floor 7″ thick with a surcharge of $\frac{3}{4}$ cwt. per foot superficial, the combined load would be about $1\frac{1}{4}$ cwt. per foot, the load on each joist being then $14' \times 3' \times 1\frac{1}{4}$ cwt. $= 52\frac{1}{2}$ cwt., about the safe load for such a joist. Under this load the theoretical deflection for a wrought-iron joist of the given proportion of depth to span, viz. $\frac{1}{28}$, will be about $\frac{15}{32}$ of an inch: it will not actually deflect quite so much, for, being bedded more or less solidly in the concrete, some extra stiffness of uncertain amount is thereby given to it.

Proceeding on the statement already given, that the safe load on steel is 40 per cent. greater than that on wrought-iron, a load of $3\frac{3}{4}$ tons may be put on a steel joist of similar section; but its elasticity being nearly identical with that of wrought-iron, its deflection under that load will also be increased by 40 per cent., becoming $\frac{11}{16}$ of an inch. Of this deflection $\frac{3}{8}$ of an inch is due to the surcharge of $\frac{3}{4}$ cwt. per foot on the floor, and for the given span is rather excessive.

It will thus be seen that there is no economy in the use of steel for floor joists where the wrought-iron joist of similar section has been selected of such small depth in proportion to span, that in *its* case the safe limit of deflection has been reached. If a steel section *can* be procured of the same depth, of which the sectional area is nearly $\frac{1}{3}$ less, or, if the sectional area remaining the same as wrought-iron, the depth can be increased, then a great economy will result from the use of steel; at present, however, except in some few instances, the steel joists rolled in this country are almost identical in section with those of wrought-iron. Therefore, for the economical use of steel joists as at present made, the simplest plan is to use deeper sections placed further apart. In using these deeper and heavier sections, where the proportion of depth to span is not more than from $\frac{1}{15}$ to $\frac{1}{20}$, the deflection will be well within safe

limits, and in such cases the full advantage can be taken of the stronger material. Thus, if a $12'' \times 6''$ wrought-iron joist at, say, 18′ span, can at 5 tons limit of stress safely carry 12 tons, a steel joist of similar section at 7 tons limit of stress would safely carry 17 tons.

From the foregoing it may be assumed that for joists, both iron and steel, which with 5 tons stress per inch shall not deflect more than, say, $\frac{1}{8}''$ for every 4 feet of span, the proportion of depth to span should not be less than $\frac{1}{28}$.

There is another difficulty in the use of steel joists, and that is, that they are *not* largely kept in stock at present; consequently, as it generally happens that in an ordinary building there are perhaps 10 to 12 tons each of three or four different sections, and the makers do not happen to be rolling those particular sections at the time an order is given, it may be necessary to wait five or six weeks before the rolls are changed to the section required. An amount of even 20 tons is not sufficient to induce the makers to incur the expense of changing the rolls; so that, if the work is in a hurry, and it is decided to pay the cost of changing the rolls on a comparatively small number of joists, the economy in the steel ceases to exist. Thus, until the makers or some larger dealers begin to stock steel joists to the same extent as wrought-iron ones are stocked at present, there is not much opportunity of using the stronger material unless a large order can be given, or a long period of time allowed for its execution.*

Compound Girders, or Rolled Joists with additional Flange Plates riveted on.—A very useful and economical form of girder can be made in this way, and the mode of calculating its strength or sectional area is identical with that given for wrought-iron girders further on, with this difference: that, considering the inferior quality of the material in rolled joist flanges, the limits of stress for these sections should not exceed 5 tons per inch of sectional area, and, in calculating this, only one rivet-hole need be deducted from the joist flange, the holes not being placed opposite to one another. The greater part of the flange section being usually in the joist itself, fewer rivets are required to attach the plates than in a built-up girder. If only a single plate top and bottom is used, $\frac{3}{4}''$ rivets at 8″ pitch placed zigzag will suffice. The holes for rivets in the joist should always be drilled, for the iron in the flanges must necessarily be under worse conditions than the rest of the metal in the joist; and cracks have been seen in rolled joist flanges extending from the rivet-holes to the edge, the strength of the girder being diminished thereby to the extent of 10 to 20 per cent.

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* In the matter of steel joists, since reading this Paper, I find that there is a firm in London who are now largely stocking steel joists, and prepared to give immediate delivery of small or large parcels of most of the sections between 3″ and 16″ deep. During the discussion of this Paper the question was asked, "When you "order a *steel* joist, how are you to know that you get it, and how can you distinguish between a steel and iron "joist?" My reply is, that steel joists have generally a better surface, and seem more cleanly rolled than iron joists. No rule can, however, be given to distinguish between them at sight; and if the quantity ordered be not sufficient to pay the cost of a test, you must trust to the honour of the dealer that he is giving you the article you pay for.—F. T. R.

Heavy-section rolled joists carrying loads not exceeding 20 tons may sometimes have their attachments made to columns, by bolting the webs to lugs cast on the columns; but in the case of heavier loads, and nearly always in the case of compound girders, vertical angle irons should be riveted on each side of the ends of the web, partly to act as end stiffeners to it, and partly as a means of making a more reliable connection to the column or stancheon [Illustns. i, ii].

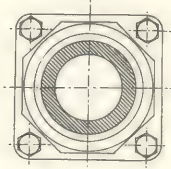
Wrought-iron and Steel Riveted Girders.—The process of calculating the strength and designing the section of a girder, which, to save time, was only very briefly described under the general heading of Cast-iron Girders, must now be noticed at greater length. It has already been pointed out that the span of a girder is the distance between the centre of its bearings; and, also, some stress has been laid upon the necessity of giving as great a depth as possible, partly from motives of economy of material, but principally to avoid undue deflection. A practical illustration being more useful than a bare statement of rules, suppose that a girder has to be designed of 20 feet span to carry a load of 30 tons, equally distributed over its length. Assume that the circumstances of the case allow of almost any depth, and as the limits of $\frac{1}{12}$ to $\frac{1}{20}$ of the span have already been given, take the mean, or $\frac{1}{16}$, of the span, which is 15 inches; this will be the depth of the girder between the inside of the flanges, which in an ordinary girder may be considered as the centres of the sectional areas.

The first thing to be determined is the measure of the effect of the load, or what is called the bending moment—in words, the load in tons multiplied by the span in feet, and the product divided by 8 for distributed loads, or 4 for a central load. As girders are all levers of one sort or other, and the principle of the lever is well known, it is not necessary here to explain the divisors 8 and 4: $\frac{30 \text{ tons} \times 20 \text{ feet}}{8} = 75$ foot tons. This is the effect of the load or greatest bending moment at the centre of the span in this example, and it is now required to find what section of girder is necessary to resist it, or the moment of resistance. The depth has been fixed at 15″, and the material is to be wrought-iron.

If the load assumed above is a dead load—that is, a solid mass of brick or stone wall weighing 30 tons—the limit of stress for the material named should not exceed 5 tons per inch. If it were a mixed load—say 15 tons of dead weight and 15 tons of floors which would never be completely loaded over the whole area—part of the floor load becomes hypothetical, and the limit of stress may be increased to 6 tons per inch. The latter case being the most usual condition, take 6 tons.

The moment of resistance will then be the depth in feet, equal $1\frac{1}{4}$, multiplied by the limit of stress, 6 tons, multiplied by the sectional area of one of the flanges.

As the moment of resistance has to be equal to the bending moment, the required area of the flange will be the bending moment, or 75 tons, divided by 6 tons limit of stress multiplied by $1\frac{1}{4}$ foot depth, or $\frac{75}{6 \times 1\frac{1}{4}} = 10$ inches; this is the net sectional area of the flange after deducting rivet-holes. It was formerly considered necessary



PLAN AT A.A.

EXAMPLE OF A COLUMN
WITH TURNED FLANGE JUNCTION.

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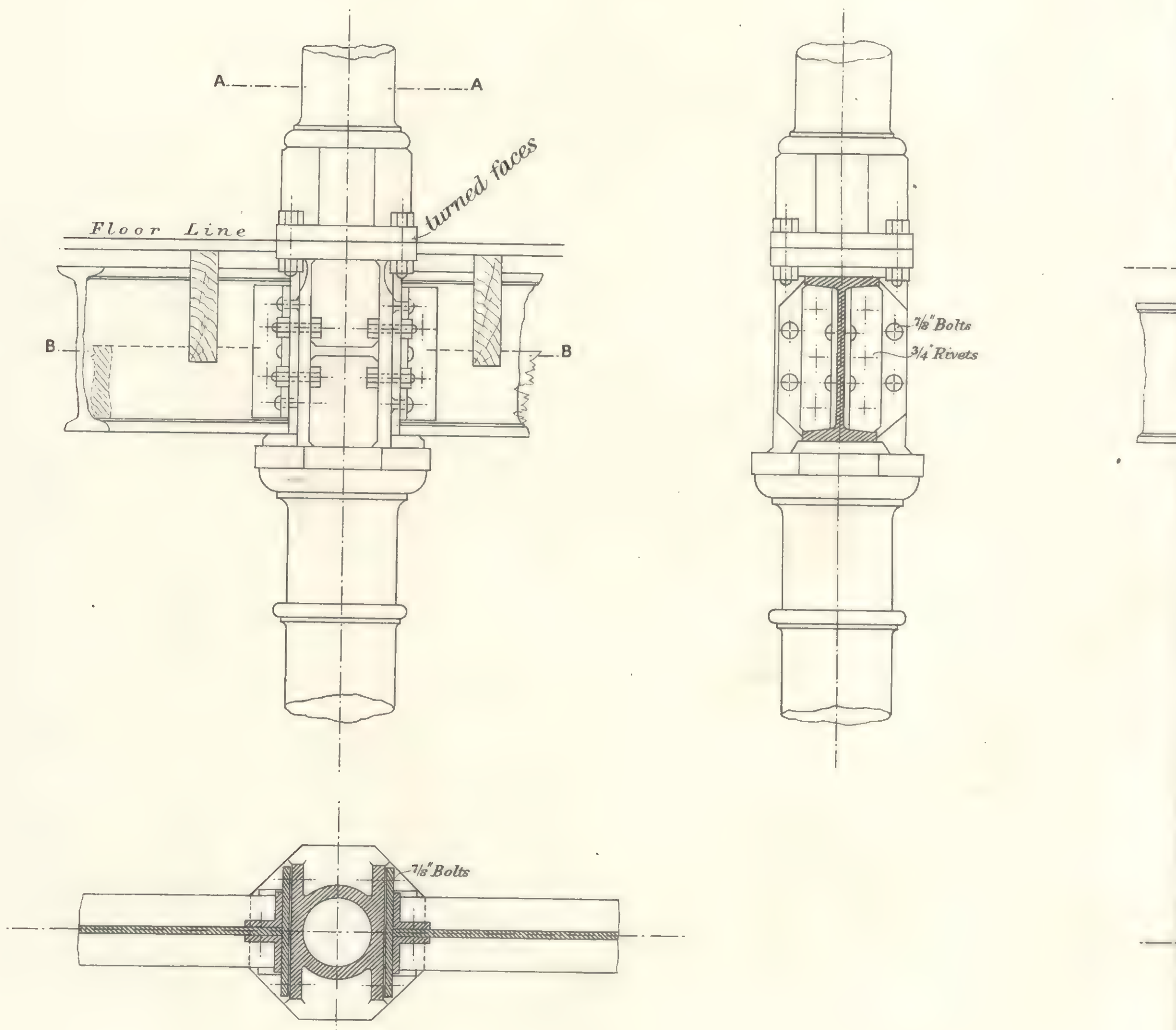


PLAN AT B.B.

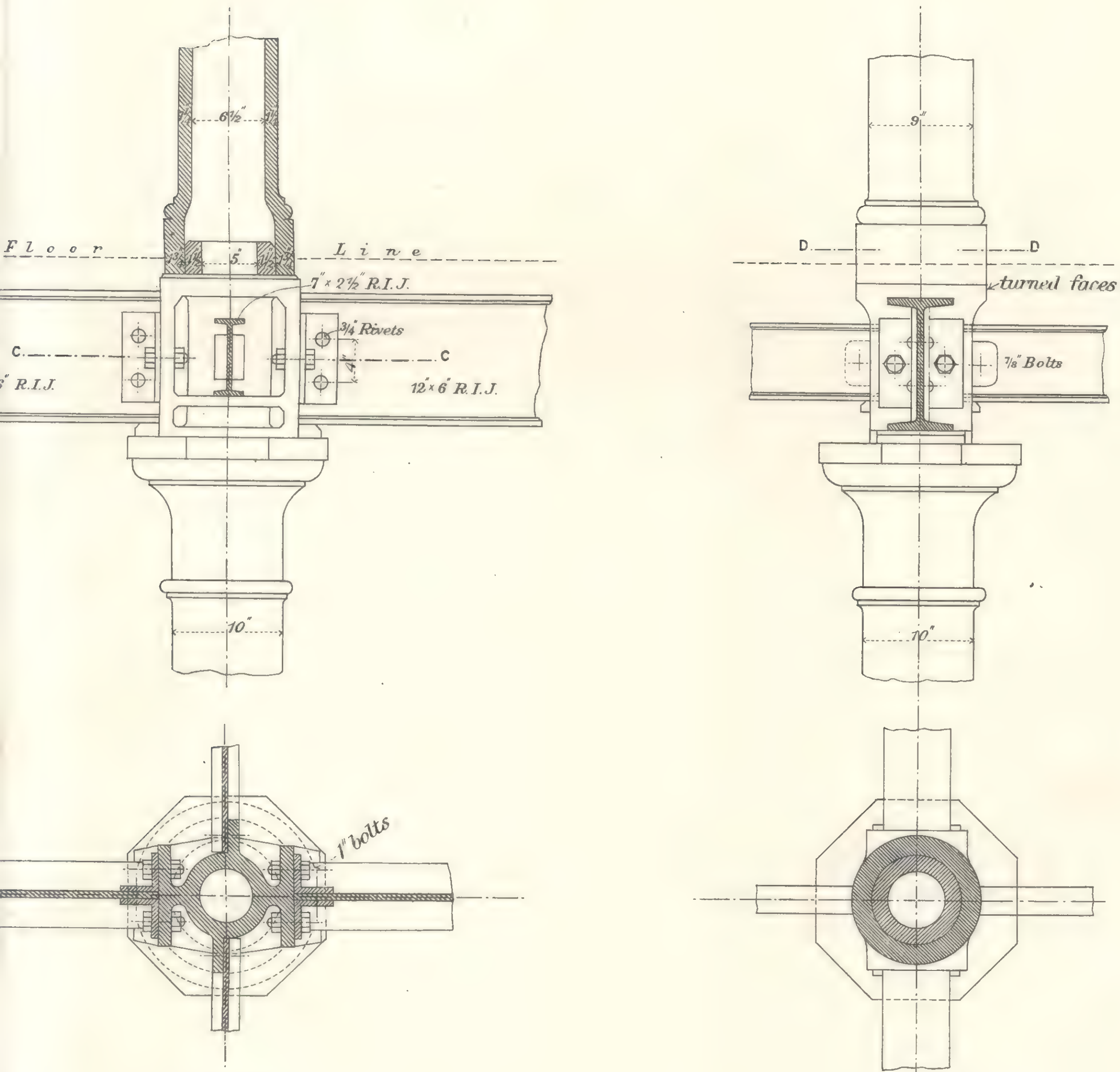
Scal

12 9 6 3 0 1

F. T. Reade, del.

EXAMPLE OF A COLUMN
WITH TURNED SOCKET JUNCTION.

19 and 28.]



PLAN AT C.C.

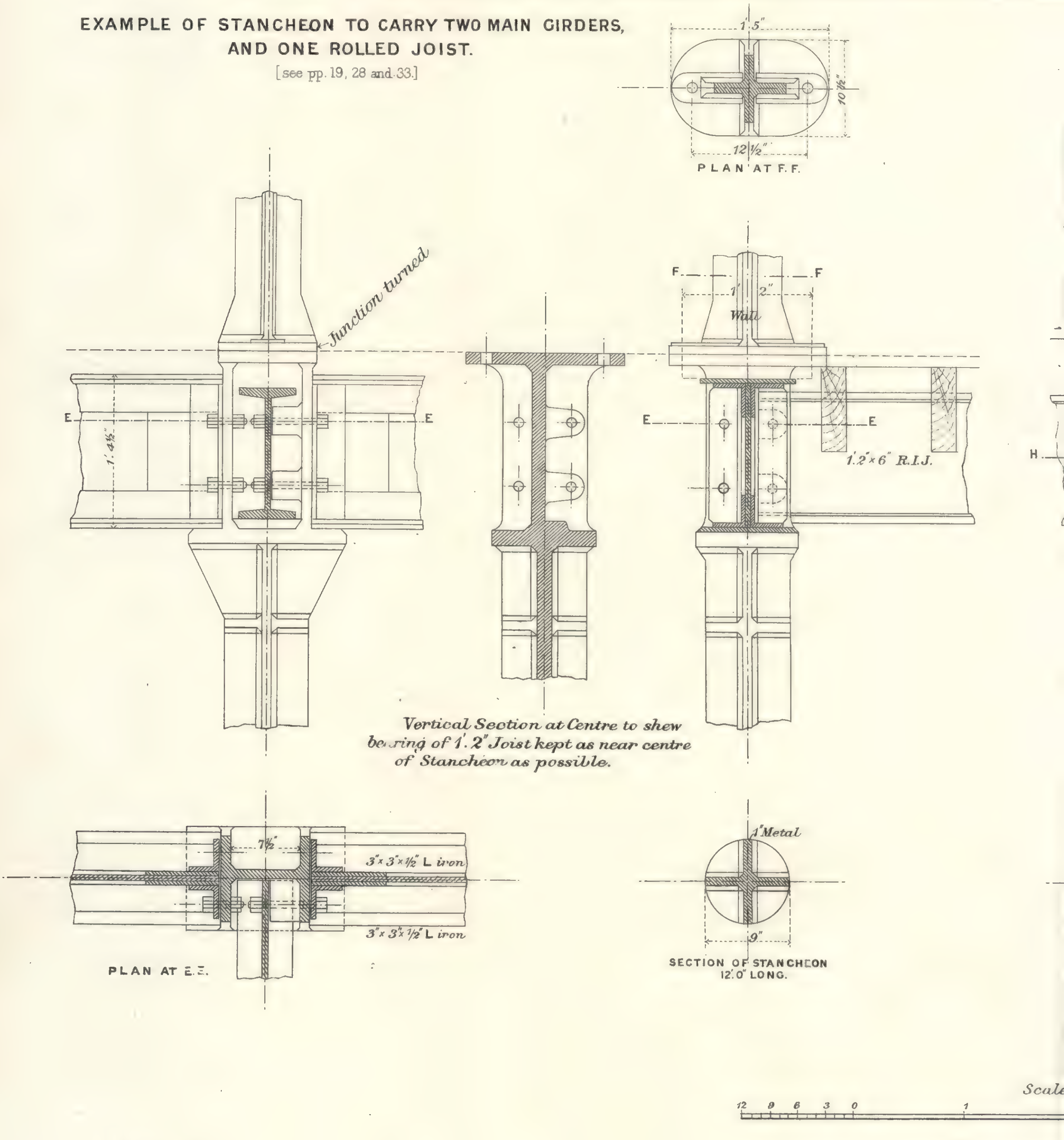
PLAN AT D.D.

Feet.
3 4 5

C F KELL, LITHO, 8, FURNIVAL ST HOLBORN, E.C.

EXAMPLE OF STANCHEON TO CARRY TWO MAIN GIRDERS, AND ONE ROLLED JOIST.

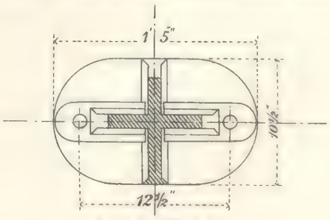
[see pp. 19, 28 and 33.]



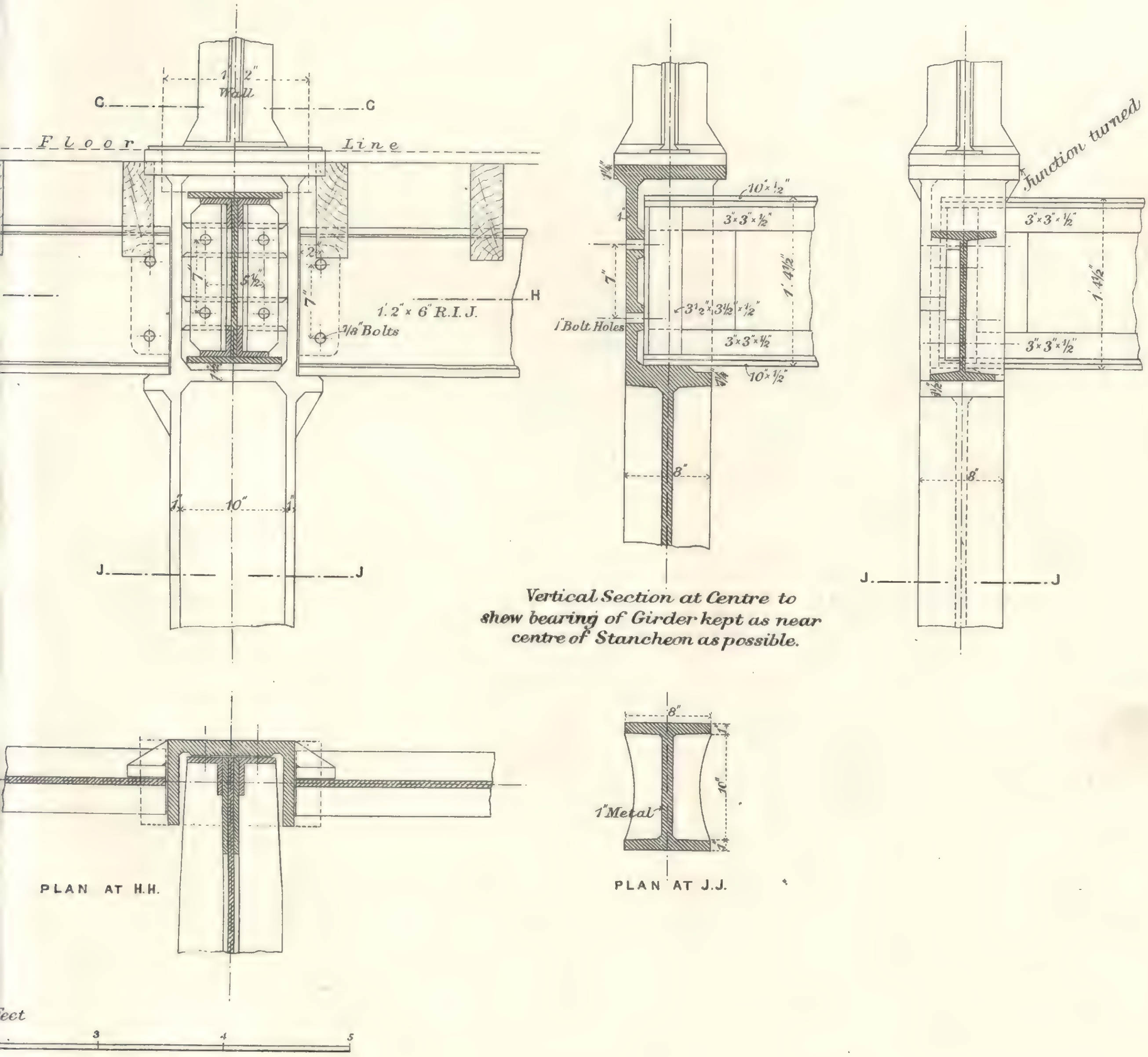
F. T. Reade, del.

EXAMPLE OF STANCHEON TO CARRY A SINGLE MAIN GIRDER, AND TWO 1'. 2" JOISTS.

[see pp. 19, 28, and 33.]



PLAN AT C.C.



Vertical Section at Centre to shew bearing of Girder kept as near centre of Stancheon as possible.

PLAN AT H.H.

PLAN AT J.J.

C F KELL, LITHO, 8, FURNIVAL Sᵀ HOLBORN, E.C.

to make the top flanges of wrought-iron girders stronger than the bottom, but the general practice is now to make them equal except under special circumstances, as, for instance, in bridge or roof girders in which the top flange has no lateral bracing or other support.

It requires no proof that the top flange being in compression, unless it has a certain horizontal width, the girder might possibly fail by bending sideways, even though it had an area in excess of the 10 inches required. It will be sufficient for the present purpose to fix the limit of breadth for the top flange at $\frac{1}{20}$ of the span.

It generally happens that, from the way in which the load is applied on the top flange, a sufficient width is fixed by practical considerations, such as the thickness of wall carried by it—say, in the present instance, 14 inches. This could very well be carried by a plate 12″ wide; this plate and the angle-irons connecting it to the web form the top flange. The size of these angle-irons must first be determined. There are some points connected with the riveting which affect the size of the angle-irons, which will be considered further on, the usual sizes of angle-irons being from 3″ to 4″ and $\frac{3}{8}$″ to $\frac{5}{8}$″ thick.

In designing girders for a building it is always advisable, as far as possible, to have angle-irons of uniform section; this facilitates delivery from the works and is also cheaper. Only one example being under consideration, fix the angles at $3\frac{1}{2}'' \times 3\frac{1}{2}'' \times \frac{1}{2}''$, gross area of each $3\frac{1}{4}$ inches; deducting two $\frac{3}{4}$″ rivet-holes, net area of each angle-iron $2\frac{1}{2}$ inches, or for both 5 inches, leaving another 5 inches to be made up by the net section of the top plate, which, being 12 inches wide, deducting two $\frac{3}{4}$″ rivet-holes, will leave $10\frac{1}{2}$ inches, which at $\frac{1}{2}$″ thick gives $5\frac{1}{4}$ inches area, and, added to 5 inches in the angle-irons, gives $10\frac{1}{4}$ inches, or a fraction more than the area required. Except for special reasons, the bottom flange may be of similar section; should any such special reason require it, it may be made narrower, for, being in tension, its width is practically of no importance, and in the present case it might be made of an $8'' \times \frac{3}{4}''$ plate; but when the bottom flange is reduced in width, unless the bearing at ends is on an iron column or stancheon, it is advisable to rivet on at each end a wider bearing-plate, to which the end stiffeners of the web should be cranked and riveted.

In the case of girders larger than the present example, where the flanges require to be made of two or more thicknesses of plates, it is not necessary that the whole of the plates should extend the full length of the girder, for it is evident that the effect of the load or bending moment decreases as it approaches the ends, while the shearing force increases, except in the case of a single centre load.

It is not possible to give a simple arithmetical rule for stopping off the flange plates, but it can be done graphically by constructing a diagram of the plates and angle-irons, in which their thicknesses are shown proportional to their respective sectional areas. A parabolic curve, whose height at the vertex represents, on the same scale, the total sectional area found to be required at the centre, is then drawn through the ends of the base line; but this may be represented with sufficient accuracy by a segment of a circle, when the scale of the diagram is such that the height of curve is

not more than $\frac{1}{6}$ the length of base. The points where the curve cuts the successive horizontal lines show the points at which plates can be stopped. This simple form of diagram only applies to an equally distributed load. Where loads are irregularly distributed, the curve takes a different and more complicated form, which can be determined by the rules of graphic statics. Most of the calculations can be made in a similar manner, and the modes of doing this are very clearly and simply described in two books on *Strains in Ironwork*, and *Designing Wrought- and Cast-ironwork*.*

In designing girders beyond 30 feet long, and with flanges built up of several thicknesses of plates, it is necessary to make the plates in such lengths that their weight shall not exceed the limits allowed by the iron-makers without extra. This limit of weight may at present be taken at 6 to 8 cwt., and the limit of area at 30 feet.

The web and riveting now alone remain to be considered, and it is somewhat difficult to treat this part of the subject simply.

The shearing force at each end of any girder, with the load equally distributed, is clearly half the total load on that girder, and to determine the riveting in the angle-iron and web in the first 12 inches of length at each end of the girder, that shearing force (in this case $\frac{30}{2}$ or 15 tons) must be multiplied by 12 inches, and the result divided by the depth of the web (in this case 15 inches) $= \frac{15 \times 12}{15}$, or 12 tons per foot. The rivets have been taken at $\frac{3}{4}''$ diameter, sectional area equal ·44 each, and the limit of shearing stress in girder work being generally taken at $\frac{5}{6}$ the limit of tensile stress (or in the present case 5 tons per square inch) to get the resistance of each $\frac{3}{4}''$ rivet to shearing, multiply $0{\cdot}44 \times 5$, which gives $2\frac{2}{10}$ tons for each rivet in single shear; but as each rivet passes through two angle-irons, they are in "double shear," making $4\frac{4}{10}$ tons for each rivet, dividing $\frac{12 \text{ tons per foot}}{4\frac{4}{10}} = 2{\cdot}85$, say three rivets. These are required in the first foot of length to attach webs to angle-irons, giving a pitch of 4 inches. Thus, if the riveting commences at 4-inch pitch, or 3 to the foot, there will be a small excess as far as shearing is concerned.

This does not complete the riveting subject; the necessary bearing area of the rivets in the web has yet to be determined, which also finally fixes the thickness of the web. The limit of pressure per inch of sectional area of rivets in the web may be taken as the limit of tension $\times 1\frac{3}{4}$,—in the present case 6 tons $\times 1\frac{3}{4} = 10\frac{1}{2}$,—the total effect of the shearing force, as already found, being 12 tons: then $\frac{12}{10\frac{1}{2}} = 1\frac{1}{7}''$ bearing area required. There are three $\frac{3}{4}''$-rivets in 12 inches of length at ends, equal $3'' \times \frac{3}{4}''$ or $2\frac{1}{4}$ square inches, and by $\frac{1}{2}$ inch in thickness $= 1\frac{1}{8}$ square inch. Thus the web must be not less than $\frac{1}{2}''$ in thickness at ends.

The shearing stress diminishes to nothing at the centre of the span, and in large

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* *Strains in Ironwork:* being a course of Elementary Lectures delivered before the Society of Engineers, 12mo. Lond. 1884. By Henry Adams, M.Inst.C.E., published by E. & F. N. Spon. *Designing Wrought- and Cast-ironwork:* in 5 parts, 8vo. Lond. 1883–88. By Henry Adams, M.Inst.C.E. Published by E. & F. N. Spon.

girders it is possible to reduce the thickness of the web towards the centre, and also the number of rivets per foot; but in the present example the web would be of uniform thickness, and rivet pitch might be uniform from end to end of the girder.

Generally speaking, for rivets connecting the angle-irons to the web in a single web girder in which the rivets are always in double shear, it may be stated that bearing and shearing resistance are equal,

for $\frac{3}{4}''$ rivets	in	$\frac{1}{2}''$ web,	or	two $\frac{1}{4}''$	webs if a box girder;	
,, $\frac{7}{8}''$	,,	$\frac{5}{8}''$	,,	two $\frac{5}{16}''$	to $\frac{3}{8}$ if	,,
,, $1''$	,,	$\frac{3}{4}''$	,,	two $\frac{3}{8}''$	to $\frac{7}{16}$ if	,,

It will be seen from the foregoing how very important is the element of depth in a girder; for if the depth had been taken less than 15″, it is clear that a greater number, or larger rivets would have been required, and also a thicker web; hence the reason for making shallow girders of tubular or double web section.

It is of the utmost importance that all riveting should be done in the best possible manner. The "snap" or end of the rivet, which is hammered out while red-hot, should project uniformly all round the diameter of the rivet. Rivets should be of uniform size, and any of them showing radiating cracks, or being of a size much smaller than the others, should be condemned; also, wherever countersunk rivets are required for bearings &c., the plates or angles should have the rivet-holes countersunk by the drilling machine, and show on the outside at least $\frac{3}{8}''$ to $\frac{1}{2}''$ larger in diameter than the size of the rivet-hole. It is a very common practice to trust to the taper given to the holes in the process of punching, and so save the small additional cost of countersinking. This cannot be too strongly condemned, as such rivets are often loose in the hole, and thus do no work. It is easy to detect such loose rivets by placing the finger on the snap or counter-sunk end, and lightly tapping the head with a hand hammer; the movement of the rivet in the hole, if loose, is immediately detected, and they should be cut out and replaced by new perfect rivets.

It is sometimes convenient, and, in the matter of getting sufficient rivet area, is often very advantageous, instead of using a single girder of tubular section, to make two single-web or twin girders. For a uniformly distributed load, these girders would be of equal strength, each carrying half the load; but as it often happens that a concentrated load occurs on one side of a girder, the twin girder on that side should be made proportionately stronger; or, should it happen that two rolled joists of similar section are considered equal to the combined loads, then these joists should be firmly bolted together with cast-iron distance blocks between the webs, so formed as to fit tightly between the flanges, and to be a little clear of the webs, before the bolts are tightened up.

For a concentrated centre load the bending moment is clearly the half load multiplied by the half span, and in the case of a girder having a distributed and a central load the two moments added together form the total bending moment.

For girders of large span and carrying heavy loads, $\frac{1}{6}$ part of the net sectional area of the web may be included; but in such cases the weight of the girder itself has

to be considered as part of the load to be carried; in a small example, such as the present, the efficient sectional area of the web may be considered as the equivalent of the weight of the girder.

Where the ends of the webs rest on a wall, or column, or stancheon, they should be stiffened by vertical T- or angle-irons, and also at any point of their length at which a concentrated load may be applied; and to save the weakening of these stiffeners by cranking the ends, and cost of forging them to fit in between the webs and angle-irons, it is usual to line up the webs by pieces of iron of the full width of the stiffeners, and of the same thickness as the angle-irons. All stiffeners should be carefully fitted between the flanges of the angle-irons, and more particularly should bear hard upon the bottom ones at the ends of the girder, and against the top angle-irons for the intermediate stiffeners, where loads occur over them.

The process of designing a girder in steel is exactly as above described, except that a higher limit of stress is introduced into the calculations, it now becoming 7 tons for a dead load, and $8\frac{1}{2}$ tons for a mixed load of floors and brickwork, or floors only. It is not advisable to make the webs of steel girders as thin as the increased strength of the material would seem to render possible, except in girders of dimensions much beyond our present example. In the rivet-holes in both materials it is usual in good work for all holes to be drilled; but in *steel* girders of any description this should always be done, for the effect of punching upon the steel is to weaken the metal for a certain distance round the hole. This is sometimes remedied by punching the holes to about $\frac{1}{8}''$ less than the diameter of the rivets, and then drilling out the holes to the larger size.

It may sometimes happen that a very heavy load has to be carried over a long span in a building of several storeys, and to avoid the projection of the bottom flange of the girders below the ceiling of the ground floor, no greater depth than 10 or 12 inches can be allowed for a girder. In such a case a trussed girder of the full height of the storey may be used, the top flange being concealed in the second floor, and the bottom flange in the first floor, the suspending rods and bracings being covered by the first floor partitions; such a girder would require to be specially designed to meet the circumstances of the case, and the process of doing this is beyond the limits of the present Paper. The same remark also applies to wrought-iron roof principals; and it may be noted that the practice is increasing of constructing both the low-pitch roof and the mansarde in iron and concrete.

An adaptation of iron to the purposes of shoring may also be mentioned. It is very useful in the case of an opening to be cut through a wall at such a height above the ground level that ordinary wood shores and needles would be costly, and also prevent business being carried on in the lower storeys during the alterations. Rectangular frames can be constructed of rolled joists or channel-irons, connected at the corners of the frames by tightly-fitting bolts. The upper and lower members of the frames are then passed separately through small openings in the wall, and the vertical sides bolted up to them on opposite sides of the wall. The weight of the wall above can then be taken

up by the frames by wedging or other adjustment, and the portion of wall between the upper and lower members of the frames cut away for the insertion of the girder or girders. The frames are generally placed from 3′ to 5′ apart, according to their strength and to the load to be carried by them. Several such frames have been designed for members of your Institute, notably some for Mr. Verity during the extension of the Criterion Restaurant. In 1878 an opening had to be cut in the end wall of the large dining-hall, and girders carrying 70 tons at 25′ span inserted, at a height of about 58 feet above the ground. This was safely done without interfering further with the business than by boarding off a space of about two feet wide on the inside of the dining-hall. Similar frames have since been used in several cases, where wood shoring would have been almost impracticable. As such frames have generally to be specially designed to meet the varying conditions of the building undergoing alteration the above general description will suffice here.

Painting of Ironwork.—It very often happens if any part of the ironwork is completed before the building is ready to receive it, that it is allowed to lie about in the maker's yard for several days, exposed to all sorts of weather, unpainted. A coat of rust forms on it, and after this no paint will properly adhere to it. All castings directly after being trimmed, and all wrought-iron as soon as put together and riveted up, should have a coat of boiled linseed-oil, the oil being applied hot; and in this condition they should be delivered at the building, or inspected before delivery. It is very difficult to conceal bad workmanship or flaws in a casting, if the work is delivered coated with oil only. A single coat of oxide of iron paint after the ironwork is fixed will generally suffice for work inside a building, if the first coat of hot oil has been applied before rust has begun to form.

General Principles.—Where the ends of girders carried by iron stancheons or columns are attached to the stancheons by angle-iron cleats riveted on the ends of the girders, to insure good work the holes for the bolts should be drilled in the cast-iron. In the case of a rolled-iron joist carrying only a light load, the attachment may be made by bolting the web to a lug cast on the stancheon; but the holes should also be drilled. Where there are girders of about equal loads on opposite sides of the same stancheon, it is not of much importance that the bearings of the ends of the girders are away from the centre of the stancheon; but, in the case of a single girder bringing a load on one side of the stancheon only, it is important that the end of such a girder should be as nearly as possible at the centre of the section of the stancheon [Illustn. ii]. This is comparatively easy to do, in the case of an H section, where the end of the girder can be fixed against the web, but more difficult with a + section; and where stancheons are continuous for several storeys, it may be done by making the stancheon with a kind of box-head, or H section, to receive the end of the girder.

Where stancheons or columns are continuous through several storeys, their junctions should always be turned; this not only makes a better joint, but saves labour in fixing, and to an extent which exceeds the cost of turning. All stancheons and columns should be fixed at each floor level by having joists or girders in at least

three directions, and their junction flanges should project so that bolt centres may be placed as far apart as circumstances permit from the centre of the stancheon. Where a stancheon rests upon a girder, the girder should be flush riveted on that part of the flange on which the stancheon rests, and the base flange of the stancheon should be cast with projecting ribs about $\frac{3}{4}''$ wide, and $\frac{1}{4}''$ to $\frac{3}{8}''$ deep, which can be adjusted to the girder flange by chipping until the stancheon is vertical; the bolts should then be tightly screwed up, and the $\frac{1}{4}''$ space under the stancheon base caulked with iron cement, as used for tank joints [fig. 1, page 19 *ante*].

The phrase "Builders' ironwork," which has unfortunately now become almost a trade term, cannot be too strongly condemned; it is used to designate an inferior description of work which is considered good enough for ordinary buildings. Of course, where, as in buildings generally, the constructional ironwork is usually covered, the fine finish to girder work, such as planed edges of plates, is perhaps superfluous, except where flanges of girders are to be visible; but it cannot be too strongly insisted on that in all other respects—such as good riveting, careful jointing, and good fitting of vertical web stiffeners, &c.—there is quite as great a necessity for good workmanship and materials in ironwork for buildings as in the best description of railway and bridge work, the loads to be carried being, in some cases, much greater than for many railway bridges. As in ironwork for buildings the quantity is generally small in amount, the enforcement of tests of the materials, and careful and well-paid inspection of the workmanship, can scarcely be provided for, except at a cost out of all proportion to the amount of the contract. A common-sense way of treating the matter is that the architect should be careful only to accept such firms as have already established a reputation for good work, and to reserve the power of rejecting any in whom he has no confidence; also, it would be well to employ only those who themselves make both cast- and wrought-ironwork. For where these two materials are included in the same contract, if cast-iron stancheons are made by one firm, and riveted girders by another, their junctions very rarely agree when the combined ironwork is fixed.

Although the work may be small in quantity, it is always advisable to have a test clause included in the specification, not necessarily to be enforced, but to show that the material to be used must be of a certain quality; or it may be provided that, as an equivalent, the architect may be permitted to see the priced invoices of the iron-makers. The price paid per ton will enable him to form a fair judgment of the quality of the iron.

In the case of wrought-iron, the breaking tensile stress should be fixed at 22 tons per square inch, with a diminution of area at the point of fracture of at least $12\frac{1}{2}$ per cent., and an elongation of 15 per cent. in the length of a test piece not less than 10 inches. These two last conditions are most important, and where the test clause is enforced should be carefully noted, as they are better tests of the quality of the iron than the breaking strain; for example, if the test piece showed a breaking strain of 23 or 24 tons per inch, and the elongation and diminution of area were less than above specified, it would not be so good a specimen of iron as one that broke with a less amount, say 20 to 21 tons,

but in which the conditions of elongation and diminution of area at the fracture were fully complied with. This becomes more important in the case of steel, where generally it may be said that, the higher the breaking strain, the more unreliable the material. This fact is recognised in the test limits usually given, in which the breaking strain is given at not less than 26 or *more* than 30 tons per square inch, or for some purposes not less than 28 or more than 32 tons, with an elongation of 20 per cent. in 8 inches length of test piece.

In addition to the above, it is also required that shearings taken from each steel plate should be tested by being cut or planed to a uniform width of say 1½ inch, then heated to a full cherry red, and quenched in water of a temperature of 80°—afterwards bent double cold without fracture, with an inside curvature whose radius shall not exceed 1½ times the thickness of the plate. As it rarely happens, except in very large buildings, that steel is used to an amount which would pay for careful testing, it is not necessary to say more on this point.

In the case of castings, it is advisable to specify that those condemned by the architect should be broken, as cases have been known where castings so condemned have been taken away, trimmed up, and again sent on the works.

In fixing ironwork it is always advisable that the maker of the ironwork should send properly skilled workmen to fix, and make necessary connections by bolting, &c. The builder may properly be allowed to hoist and deposit large girders on their bed-stones, but all junctions should be made by the iron contractor. In putting girders on their bed-stones, it is a very common practice to put a layer of felt or a sheet of lead on the bearing or bed-stones; this is really of very little use, and is generally only a patching up of bad workmanship. It is quite possible to make the ends of any girder to be truly in the same plane, and bed-stones *can* be set level. If on lowering a girder into position, it is found not to bear truly on its bed-stone, it would be better to raise it and ease the stone a little, or even to cover it with a thin layer of cement, and then lower the girder into position. In the case of a girder not bearing truly on the head of a stancheon, this can be adjusted by chipping; or, if circumstances do not permit of this, the girder should be as far as possible adjusted, its bolt connections tightly screwed up, and the space under end bearings caulked with iron cement as for a tank joint.

F. T. READE.

⁂ The Discussion [see verbatim report in *The R.I.B.A. Journal,* Vol. VI., pp. 53–55] of Mr. Reade's Paper was opened by Mr. Robert Walker, and continued by Professor Aitchison, A.R.A., Mr. T. H. Watson, Professor Kerr, Mr. J. Tavenor Perry, and Mr. R. Langton Cole. A brief abstract of their remarks and of the reply made by the author of the Paper is here appended :—

Mr. ROBERT WALKER, *Fellow,* fully endorsed every word that had fallen from Mr. Reade on the subject of defective ironwork; and he thought that, as architects, they failed to realise the serious

consequences often involved in the use of cast-iron and wrought-iron construction. With the exception of a slight reference to iron construction in the Metropolitan Building Act, its existence had been practically ignored by the Legislature; and if a contractor chose to put into a building a girder of insufficient strength, all that the District Surveyor could do to prevent it was to take the man before a magistrate and ask to have him tried as a criminal. Mr. Walker thought that they were deeply indebted to Mr. Reade for the clear and able manner in which he had treated his subject.

Professor AITCHISON, A.R.A., *Vice-President*, after seconding the vote of thanks to the author for an interesting and instructive Paper, asked four questions respecting details of iron construction to which reference had been made therein. [These have been answered in the Paper.]

Mr. T. H. WATSON, *Fellow*, asked for information as to the material called "steel," which they were invited to use. They knew what cast-iron and wrought-iron were, but they had no ready means, he thought, of distinguishing steel from wrought-iron. [See footnote, p. 27 *ante.*]

Professor KERR, *Fellow*, added his sincere testimony to the value of the Paper. He thought architects might, without any false delicacy, recognise fully the distinction between the work of the engineer and their own work in iron. When an architect had ironwork of any real importance to design, he need not be ashamed to say that he had asked an engineer to help him; and an architect who, in these advancing days, did not do so made a mistake. One point that had forcibly struck him was the importance of perfect precision in fixing ironwork; and in his experience in building construction where ironwork had failed, it had always been traceable to imperfections in fixing. The Professor then criticised some of the statistics of Mr. Reade's Paper, and referred to the danger of not calculating, when considering ironwork, on floors being loaded. A very excellent dictum of the late Mr. Knowles was, "Don't build strong, but stronger than strong;" and that could not be too strongly impressed upon young architects. The temptation to save expense was always very great, and architects were sometimes driven hard by parsimonious clients, but such saving ought not to be effected in the ironwork of a building.

Mr. J. TAVENOR PERRY, *Associate*, agreed that no architect should trust to his own judgment solely when introducing ironwork in his buildings, but he did not think that he should specify the goods of any particular manufacturer. He should rely on the test clause in his specification and the engineer named therein.

Mr. R. LANGTON COLE, *Associate*, asked for information respecting the words necessary in describing steel for use as joists and as girders. Could Mr. Reade assure them that steel joists of a reliable character were to be obtained? [See footnote, p. 27 *ante.*]

Mr. F. T. READE, *Hon. Associate*, said that he had seen scandalous instances of the manner in which the question of ironwork was ignored by the Metropolitan Building Act, and the interference of the District Surveyor thus rendered impossible. As regards steel, it was, in the opinion of Mr. Reade, very difficult to distinguish between a piece of iron and a piece of steel, without making a chemical analysis or testing the ultimate strength of each. To be able to detect steel by a superficial glance was scarcely possible, though steel was much finer in grain and had a closer texture and a smoother surface than iron. He quite agreed with Professor Kerr as to the necessity of precision in fixing ironwork, especially in the case of drilling or of tight-fitting bolts; but the Professor had been misled as to what he (Mr. Reade) had said with regard to floors partly loaded. He had no intention of advising the reduction of the weight on the floor—for instance, if he were calculating the weight on a floor at $\frac{3}{4}$ cwt., including the surcharge of $\frac{1}{2}$ cwt., he would not treat the floor as less loaded at any one time than with that weight per foot. Mr. Tavenor Perry's objection to the name of any manufacturer being mentioned in the specification was due perhaps to the fear that some good-natured friend might say that it was an interested recommendation, but what he (Mr. Reade) wanted was that an architect should reserve the right to reject manufactures of the quality of which he had not sufficient proof. The ironwork of a building was often included in the general contract, and the contractor sometimes brought in an utterly unreliable firm to supply it, so that an architect ought always to have the power to reject such work.

LXVI.

REPORT OF A TOUR IN GREECE AND CYPRUS.

By R. Elsey Smith, *Associate.*

Mr. Alfred Waterhouse, R.A., *President*, in the Chair.

Mr. President and Gentlemen,—

In presenting the Report of the tour I made as a special travelling student in Greece and Cyprus, I have not attempted to put my descriptions into the form of a diary in any way, but have gathered together, into one account of each building or each site, the notes and information respecting them often obtained at considerable intervals.

I was in Greece from the middle of January to the end of February, and, again, from the middle of May to the middle of June 1888. The chief part of this time was spent in Athens, but I also visited some of the most famous sites of the Peloponnesus, and some of the recent excavations there will be referred to after the work in and around Athens has been described. I propose to commence with an account of what I saw in Greece, drawing attention chiefly to the most recent discoveries that have been made, and afterwards describe, from an architectural point of view, the discoveries made on the site of the Temple of Aphrodite, at Palæo-Paphos in Cyprus.

GREECE.

In Athens itself, interest centres chiefly round the Acropolis rock, where very extensive and exhaustive excavations have been carried on, during the last two or three years, by the Greek Archæological Society, under the direction of M. Cavadias, with most painstaking thoroughness, and with the greatest success. It may be well to point out that the natural rock is very different in section from the finished surface of the Acropolis, which one usually associates with it; for it comes up to the surface in the centre, but falls rapidly away on all sides. This slope has been taken advantage of on the west side in the arrangement of the Propylæa and its approaches; but elsewhere, retaining-walls have been built at different periods, and the space between the walls

and the rock filled in—with what unexpected materials, in some cases, the excavations have displayed. This slope is much greater on the south than on the north side ; at any rate, the enclosing-wall is built much further down the slope, and the mass of filling-in here is enormous. The excavations were begun on the north side of the central ridge of the Acropolis, immediately east of the Propylæa, and were pursued along the north side to its eastern extremity, and then back along the south side, terminating with the Temenos of Artemis Brauronia.* All along the north side traces of walls, more or less distinct, were found, some of which at first were supposed to belong to the Chalkotheke. The first great discovery was the collection of archaic marble statues found just north of the north portico of the Erechtheion. This very striking series of statues, many of which are in places beautifully decorated in colour, which is sometimes vivid and well-preserved, have been fully illustrated in *Les Musées d'Athènes.*

To the east of the Erechtheion were discovered extensive traces of walls, supposed by Dr. Dörpfeld to be part of the Palace of Erechtheus ; but not enough was found to render it possible to determine the plan, which is, however, believed to be contemporary with the palaces at Tiryns and Mykene. Leading up to the palace from the north-east angle of the Acropolis, a steep approach, with traces of steps, was uncovered, which no doubt communicated with a postern-gate as at Tiryns. Near to this part a considerable fragment of a large archaic Ionic cap, executed in Peiraic or Poros stone, was discovered. In the south-east angle of the Acropolis, a stone foundation, or stylobate, for a building of some importance—in all probability, a small temple—was found ; and between this point and the Parthenon remains of the circular temple of Roma and Augustus, which stood directly in the axis of the Parthenon, and 40 feet east of it, were discovered. This small temple was surrounded by an arcade of nine Ionic columns.

Along the south side of the Acropolis the excavations had to be carried to an enormous depth—in places over 40 feet ; from these excavations portions of two archaic Poros stone pediments, elaborately carved and coloured, were obtained, amongst other things. Two heads of a similarly archaic type, and of the same material, were also found, the colours at the time of their discovery being very powerful and brilliant ; but they quickly faded, although the heads were very carefully covered up. The face of one of these heads was of a reddish colour, the hair and long moustache were blue, and the eyes also blue, with a brilliant green iris.

Several unfinished marble drums also came to light [fig. 4] ; these still retained the projecting knobs, by means of which the stones were ground one upon the other, so as to secure a perfectly even and true joint. Near the rock level, a thick bed of marble chips was encountered, indicating, apparently, the spot where the marble-work was prepared for the Parthenon. The whole of the south side of the lower stylobate of the Parthenon was laid bare to its rock foundation ; it continues downwards in regular masonry, well-fitted, but without the high finish of the upper parts.

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* For a complete plan of the Acropolis, corrected up to May 1889, see *Journal of Hellenic Studies*, vol. x., Nos. 1 and 2, Pl. viii.—R. E. S.

In the *débris* between the Parthenon and the south wall of the Acropolis, two stones were obtained belonging to a delicate Doric cornice of some small building; each stone measured 2·490 feet in length, and is of fine, close-grained, white limestone. Foundation walls of some building were also uncovered, and Dr. Dörpfeld has pronounced it to be, in his opinion, the Chalkotheke. Near one of these walls a tolerably complete set of ancient mason's bronze tools was found, including several double axe-heads, 6 to 9 inches long, with slightly convex edges about $2\frac{1}{4}''$ broad; also three different forms of chisel, and a large and small bronze hammer-head, and a long file.

One of these [fig. 5, A, next page] had a fine burnished surface, still apparent in places. Three forms of chisel were found: one of these is a short, strong chisel (B), with a curved edge about $1\frac{1}{4}''$ to $1\frac{3}{8}''$ broad, and from 5 to 6 inches long; several

Fig. 4.—Excavations on the Acropolis at Athens. Unfinished Marble Drums for the Parthenon Columns.

From a photograph by R. Elsey Smith.

specimens of this were found, all very similar. There is also a very broad, wedge-shaped chisel, with a thick haft, and tapered off to a fine edge, which is slightly curved (C), apparently intended for some kind of finishing work. Finally, a long and strong chisel, with a comparatively narrow edge, somewhat like a mortice chisel; besides the one illustrated (D), a larger one, about $9''$ long and $\frac{3}{4}''$ square, was found. A long, tapered file (E) was found, with a slightly rounded section; the roughening appeared to have been formed by a series of triangular indentations, punched in the surface, close together, in the larger part in regular rows, but towards the smaller end somewhat irregularly. Two solid bronze hammers were also found—a small one (H), and a much larger one, $5\frac{1}{4}''$ long, about $1\frac{1}{2}''$ square at one end, and somewhat wedge-shaped, with a rounded small end.

This portion was not entirely excavated when I left Athens—the work had reached a point nearly opposite the centre of the cella; but since then it has been completed, and continued westwards, so as to include the whole of the Temenos of Artemis Brauronia, stretching from the Parthenon to the Propylæa. Here the work has been much lighter,

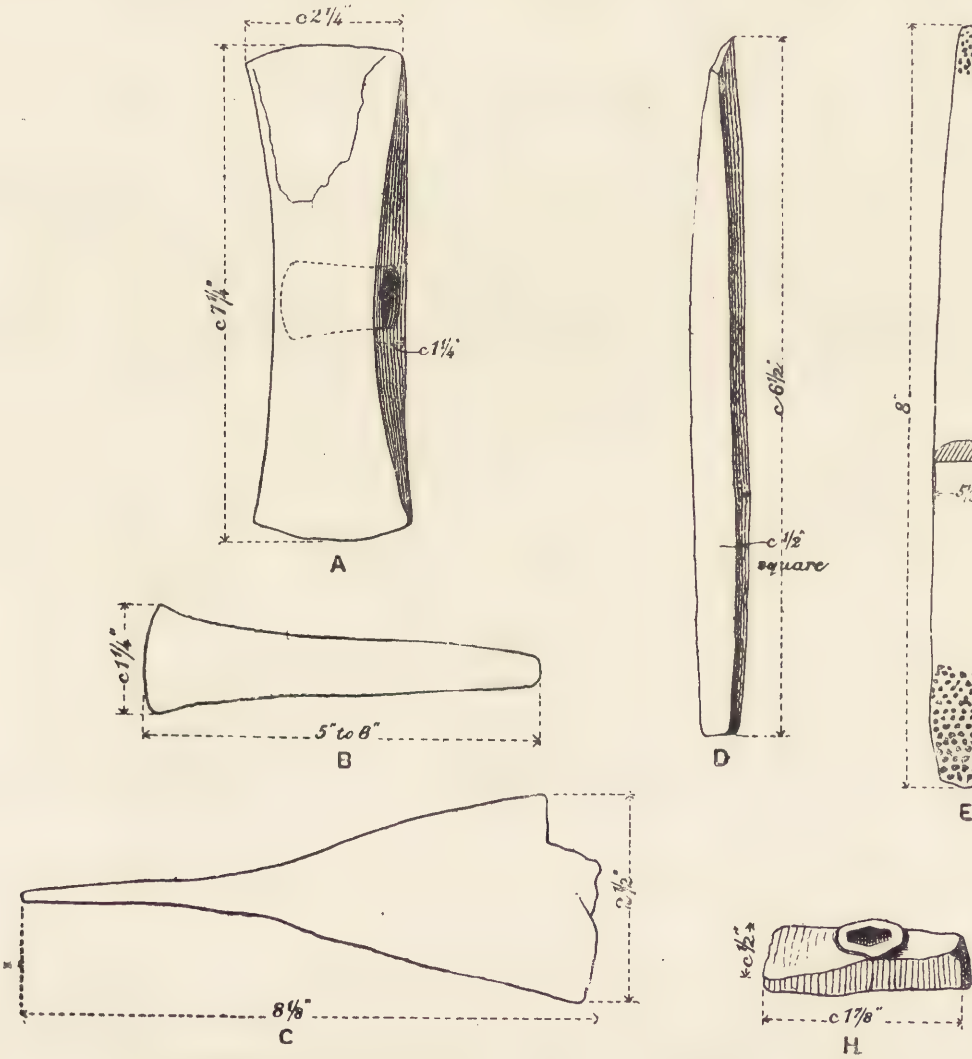


Fig. 5.—Sketches of Bronze Tools found near the sub-basement of the Parthenon.

for the rock is comparatively near the surface. The most notable find in this region is a marble head of Iris, described as belonging to the frieze.

Every spadeful of earth over the whole topmost surface of the Acropolis has now been carefully turned over, and it is quite certain that nothing of interest remains buried below the surface. In addition to the objects already mentioned, vast numbers of fragments of heads, statuettes, &c., in marble, terra cotta, and bronze; portions of vases,

early Ionic caps with painted volutes, a single piece of Greek fresco, representing a warrior bearing a shield, and innumerable fragments of all kinds, have been unearthed, and are piled in the Museum in cases, at present without labels or arrangement, and often difficult of access; but now that the examination of the rock itself is complete, their speedy classification and arrangement may be looked forward to.

The work last undertaken was the removal of all Turkish remains from the west end of the Acropolis, including the picturesque old arched entrance, and the base of the minaret built in the angle of the Posticum of the Parthenon. It is, however, proposed to carry out excavations along the north slopes of the Acropolis, where very interesting discoveries may be expected. I hope to bring before you a few points of interest in connection with some of the Acropolis buildings, partly the result of somewhat recent excavation, and partly due to a careful study of already well known buildings on the spot.

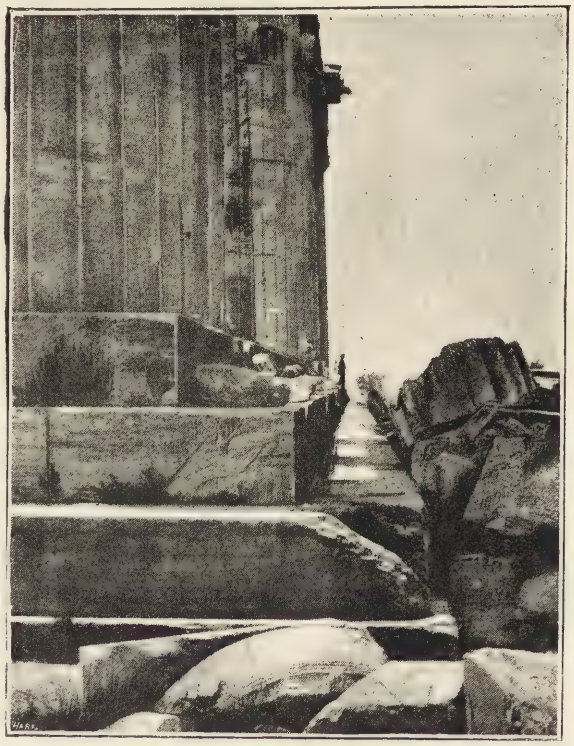


Fig. 6.—The Parthenon—View along the North Side, showing the Curvature of the Second Step of the Stylobate.

From a photograph by R. Elsey Smith.

No two architects of our age have devoted more time and more careful and loving study to the Acropolis and its architectural history than Mr. Penrose, late Director of the British Archæological School at Athens, under whose kind guidance I first had the privilege of seeing that wonderful city; and Dr. Dörpfeld, the present Director of the German Archæological School there. Mr. Penrose's work is so well known, and is so accessible here, and, moreover, has so recently been brought down to date by the issue of the splendid new edition of his *Principles of Athenian Architecture*, that it is unnecessary, and would be presumptuous for me, to speak of it further in a brief Paper of this kind; but I take this opportunity of making manifest to the eye the fact he has so completely established—that the basement as well as other portions of the Parthenon have a distinct curvature—by reproducing a photograph taken expressly to illustrate this point [fig. 6]. Even on this small reproduction the curvature between the nearest corner of the second step and the foot of the man at the further end can be detected. Dr. Dörpfeld's work is, I believe, less

familiar, at any rate to the bulk of English architects. While I was in Athens I had the good fortune to hear him lecture on the Propylæa in the building itself, and to study a set of notes made during his lecture in the Dionysiac Theatre. I gave a good deal of time to carefully examining these two buildings, on the basis of these notes, and think it may be of interest to lay before you briefly some account of Dr. Dörpfeld's views about these two very interesting structures; and though they may probably not meet with entire and universal acceptation, I may, I hope, be able to show that they are the result of a very thorough and intimate acquaintance with the buildings in every detail.

The Propylæa.—Previous to the existing buildings, erected during the time of Pericles, the Propylæa faced nearly south-west, instead of nearly west as at present. Traces of this building remain, a deep cut in the rock near the five great doors showing the line; and a considerable portion of the south-west angle of the building, attributed to Cimon, still remains, of very finely-worked Poros stone, partly faced with marble, and partly stuccoed and painted. Of an earlier date than this, though probably connected with it, are some extensive remains of Cyclopean walls.

The present Propylæa buildings were commenced in 437 B.C., under the architect Mnesicles, and work was carried on for five years, during which time great progress was made; but the work was then, says Dr. Dörpfeld, interrupted, and never resumed.* Looked at from the west (or the outside), the original and complete design for the Propylæa presented a great central gable, flanked on either hand by two lower buildings with hipped roofs. The north of these two lower buildings was practically completed, but the south was left in a very incomplete condition, and although in the general mass it was intended to balance the other wing, it materially differed in detail, having an open colonnade on two sides, instead of only one. Facing the east, or inside of the Acropolis, was another great central portico, again flanked with lower buildings, which probably had open colonnades to the east.

Of this magnificent scheme, the only portions actually completed were the great central porticoes, facing east and west, between which was the cross-wall, with the five bronze doorways, and the north-west hall, commonly known as the Pinakotheka, or picture-gallery. This consisted of a portico, with three columns, behind which was a large chamber; this was entered by a doorway from the portico, which was flanked on either side by a window.

If we examine the corresponding south-west wing, we find evidence of a widely different intention, so far as the plan is concerned. To balance the opposite wing, we again have a portico of three columns; but the wall behind is pierced by no openings, and is finished at its west end with an anta, clearly indicating from its form that it was intended to carry an architrave running westwards. In place of a wall along the west side, we have the remains of an angle-pier, carefully designed to fit in with a portico of four columns on the west side, and from its form clearly indicating that an architrave was intended to run in a southerly direction. This pier [fig. 7] is not now

* A Plan of the Propylæa, showing Dr. Dörpfeld's restoration, was published in *The Builder*, 22 Feb. 1890.—R. E. S.

in situ, having been demolished with the Turkish tower, of which it formed a part, some years back; the stones of which it was composed, however, are close at hand.

Thus, the original scheme seems to have provided for a deep portico facing to the north, a second portico facing to the west, behind which was a chamber open upon the west side, and accessible from the portico. The completion of this scheme would have involved the removal of an altar to Nike, standing in front of the little Ionic temple, and the destruction of a considerable portion of the ancient Cyclopean walls; and, whether from this cause or from some other reason, the scheme was abandoned. The portico facing north was completed, but between the westernmost column and the anta of the south wall a small pier was erected; the architrave was carried over at this point, and the roof constructed of an irregular form, the west portico and the chamber behind being abandoned.

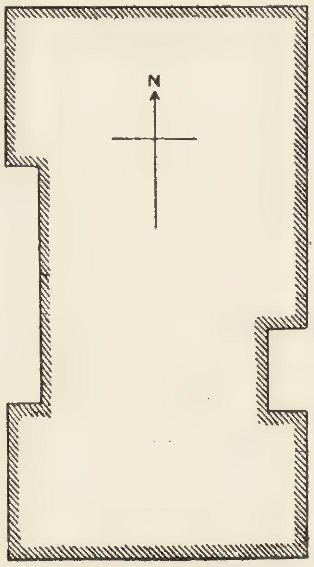


FIG. 7.—PLAN OF THE PIER AT THE NORTH-WEST ANGLE OF THE SOUTH-WEST HALL.

Scale: Half inch to a foot.

The necessity of leaving the western composition incomplete may have influenced the completion of the eastern side, where neither the south-east nor the north-east hall was finished, though preparations for the latter were carried on some way. The south-east hall would have very seriously encroached on the Temenos of Artemis Brauronia, and this fact may have had its influence on the question. The outbreak of the Peloponnesian war, however, in 431 B.C., definitely stopped the work, says Dr. Dörpfeld, and accounts for the unfinished condition of the wall-surface, even in those portions where the design was fully carried out.

Of the great stylobate of four steps, the lowest step only, which is of black marble (and this only at the north and south sides), has its surface finished. Elsewhere, for the most part a draught of about 0·200 foot is made where fitting surfaces occur [fig. 8], and on the top step a similar sinking occurs for accurately bedding the columns; but the general surface is not cleaned off.

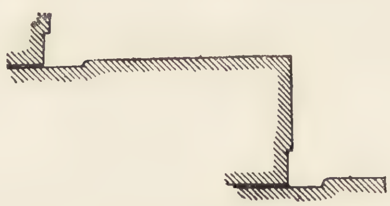


FIG. 8.—SECTION OF A STEP OF THE PROPYLÆA STYLOBATE.

Scale: Inch to a foot.

Similarly, on the wall-surface a draught occurs at all internal angles, the general surface standing forward, and forming at first glance an apparently intentional panel; but on examination the width of the draughts is so irregular that one cannot suppose they were originally intended to remain so; and, moreover, the joints between the stones, which on the finished surface are, as usual, absolutely close on the more advanced surfaces, as regularly gape, always in the same way—viz., the top bed of the stone is horizontal,

while the lower bed of the stone above is bevelled off from the point where the finished surface is intended to occur [fig. 9]. Similarly, on horizontal section one side is finished square, the other being bevelled as before [fig. 10]; by this means the chance of splitting off portions of the stone during fixing is to a great extent obviated.

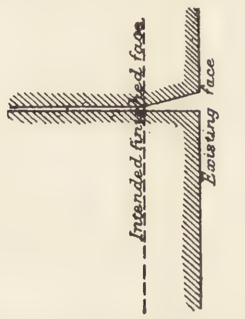


Fig. 9.—Vertical Section showing Form of Joint on Propylæa Walls.

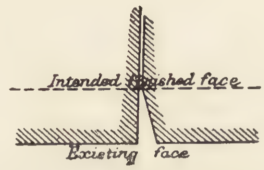


Fig. 10.—Horizontal Section showing the Form of Joint on Propylæa Walls.

The door-frames were originally intended to be of wood, covered with bronze, though in later days marble frames were substituted for them. The sinkings in the sills to receive the ends of the wood frames, as well as the pivot holes for the doors, are plainly evident [fig. 11]; and in the five central doorways there are deep sinkings in the jambs,

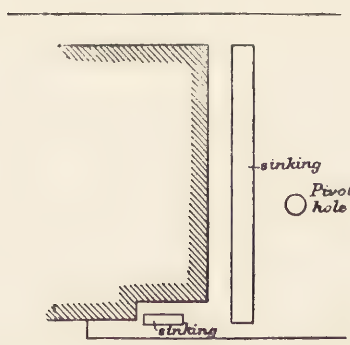


Fig. 11.—Plan of Door Jamb to the Pinakotheka.

Scale : Half inch to a foot.

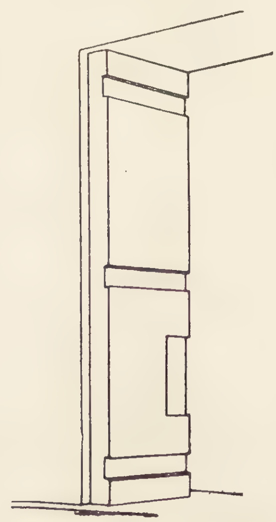


Fig. 12.—Sketch of Marble Jamb showing Sinkings for Wood Blocks.

for fixing wood blocks to which the frames could be attached [fig. 12]. In later times, when the marble jambs replaced these wooden frames, the heights of these doors were considerably reduced.

The intended section of the two inner halls can be recovered with great accuracy

from the marks on the existing portions of the building, for we find in the walls chases prepared for the horizontal ceiling-joists, as well as for a very massive square ridge-piece,

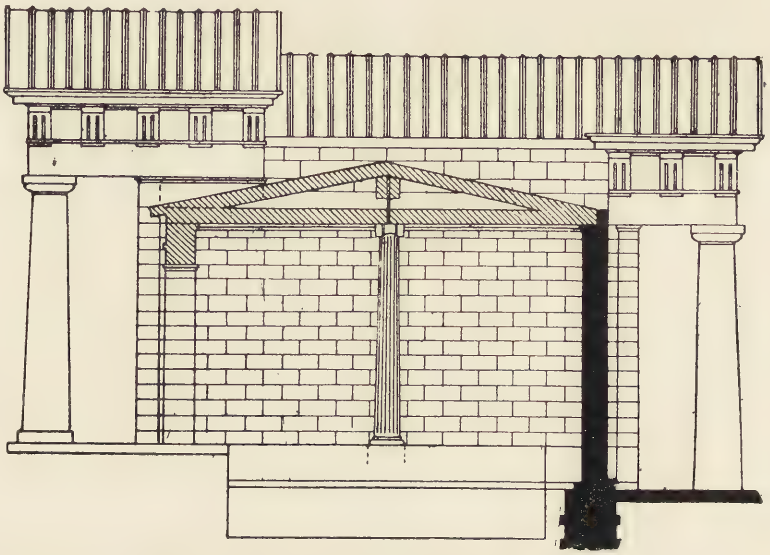


Fig. 13.—Section through North-East Hall.
Reproduced from the Journal of the German Archæological School at Athens, vol. x., 1885

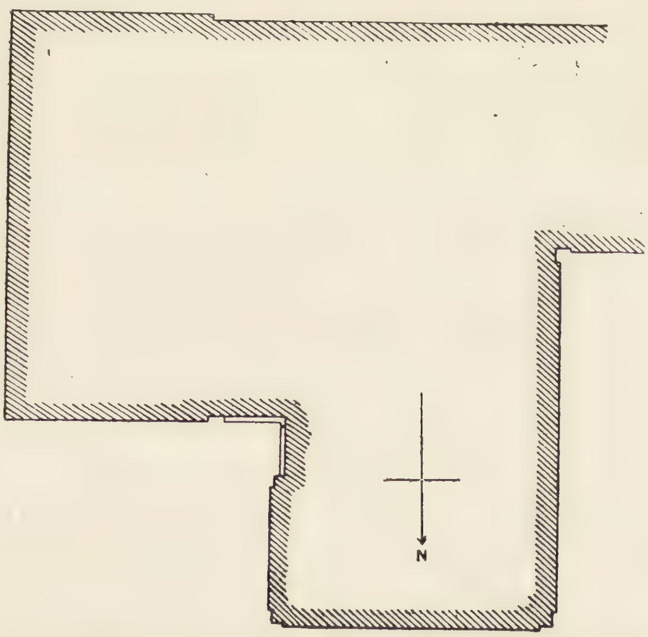


Fig. 14.—Plan of the Pier at the Angle between the East Portico and North-East Hall.
Scale : Half inch to a foot.

while a great stone below the architrave of the central gable is cut away to the intended line of the roof [figs. 13 and 15]. Two antæ belonging to the arcades facing east are

also standing—one on each side of the central feature—which, though incomplete, having no caps, materially assist in fixing the height of the Order [fig. 14].

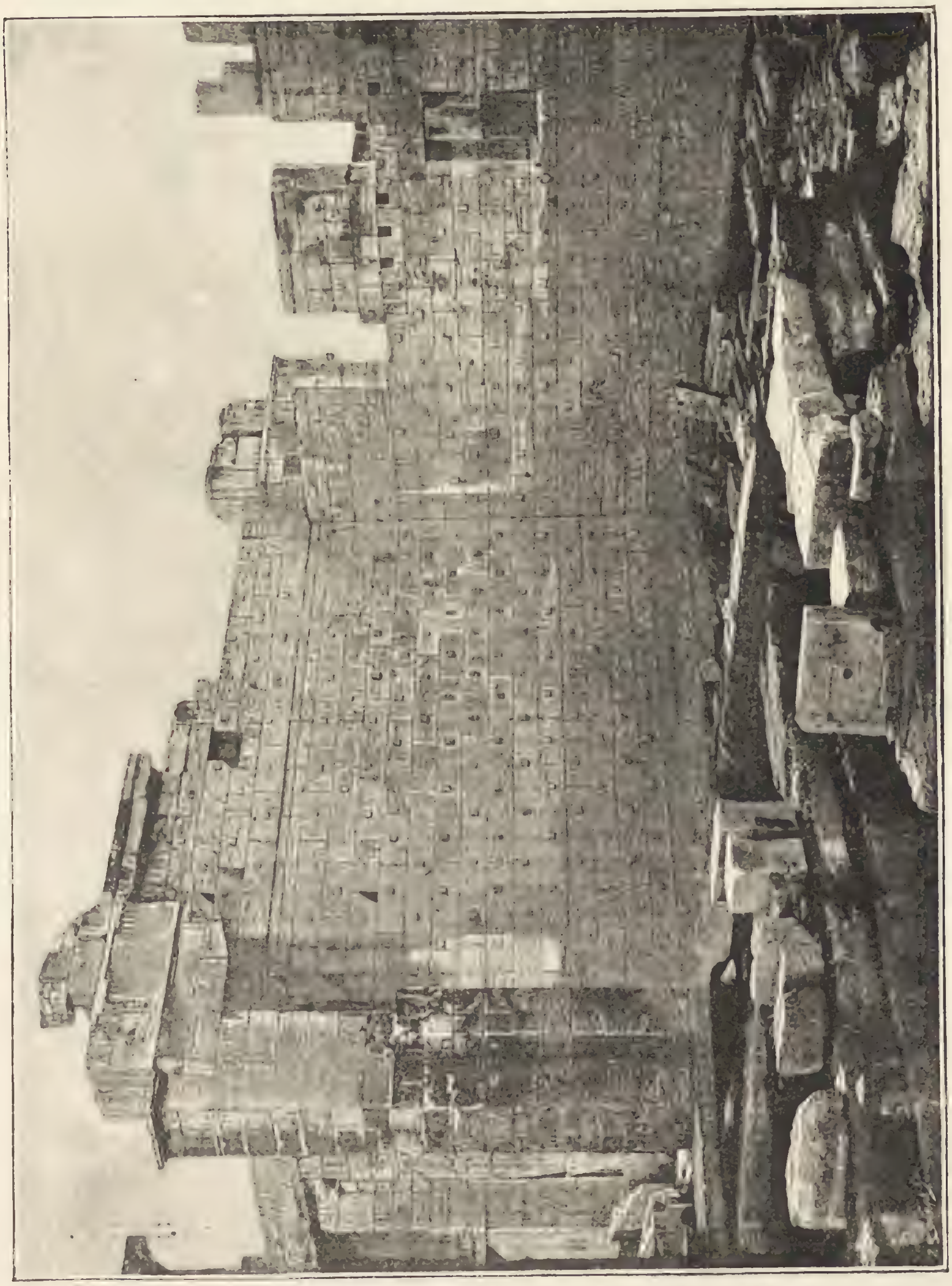


Fig. 15.—View of the North-East Hall of the Propylæa.
From a photograph by R. Elsey Smith.

The Theatre of Dionysos.—This building is of special interest as being the earliest stone theatre in Greece. Previously it had been customary to arrange the spectators

on some kind of wooden platform or staging; but in 500 B.C., during the exhibition of the first tragedy of Æschylus, this staging gave way, and a permanent stone theatre was decided on, but it was not finally completed till the time of Lycurgus, in 340 B.C.

Of the earlier orchestra, three small fragments remain, showing that it was further south, and slightly further east, than the present one; the largest portion consists of about half-a-dozen blocks of careful polygonal work—enough, however, to show very clearly the curve of the orchestra—the stone used being the Acropolis rock itself.

Belonging to the same epoch is the earliest Temple of Dionysos, which stands a little distance to the south-east, with a basement of similar materials and construction. The upper bed of this polygonal basement is carefully smoothed to receive a course of squared stones, which have neatly-fitted ends, and are clamped together with bronze

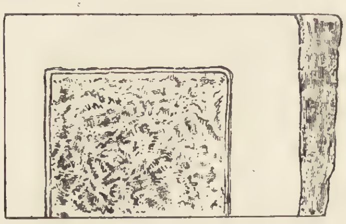


Fig. 16.—Elevation showing Method of Working the Ends of Stones; the Centre is sunk.

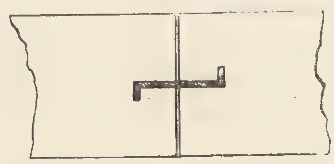


Fig. 17.—Plan showing Z-form Cramp.

clamps of the early Z pattern [fig. 17], which belong to the period previous to the Persian wars. Close to this temple, but to the south of it, and not quite parallel, is the second Temple of Dionysos; this is considerably larger, and dates from about the commencement of the fourth century B.C. It had a base of Breccia, regularly constructed of large blocks, forming a wall about 5 feet thick, and laid as headers and stretchers. Immediately on this was a course of Peiraic stone, and above that a course of Hymettus marble.

To the south of the early polygonal orchestra are the remains of a large quadrilateral hall, built to shelter the onlookers, and of similar construction to the later temple just referred to, with a basement of Breccia; above this a course of Peiraic stone, and finally a course of Hymettus marble, which is of a dark grey colour. The clamps found in this part of the wall are of the later double T form [fig. 18]. At the south-west angle this hall encroaches on the earlier temple, which has been partly cut away to receive it.

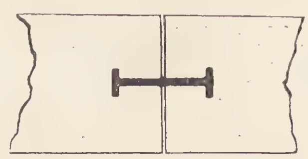


Fig. 18.—Plan showing T-form Cramp.

With the permanent stone Theatre of Dionysos was introduced a fixed back wall, on which the various scenes were displayed; this also had a basement of Breccia, Peiraic stone, and then Hymettus marble, which is very nearly at the same level as the pavement of the orchestra. Later, when it became the universal custom to adopt a street scene for all plays, a fixed architectural back scene was adopted, which was introduced here about

150 B.C. This had a basement of rough, old materials, finished with a sill of Hymettus marble, on which stood the scene—probably of the Doric Order.

The sill, or stylobate of this scene, is also practically at the same level as the orchestra pavement, and seems to indicate that, in strictly Greek times, there was nothing in the way of a raised stage, which would, of necessity, have cut off the lower part of the Order. This is even more clearly indicated in the theatre at Epidauros, which will be referred to later.

The Romans made considerable alterations to the stage, raising it to some height above the orchestra level. It was pushed forward in front of the fixed scene, destroying the complete circle of the orchestra, and the scene and older back wall were both demolished, to give extra depth to it. A new back wall was built, of irregular stones, from older materials, but in this way a stage 21 feet deep was obtained. Still later, in the third century A.D., Phædrus brought the front of the stage further forward, adding an extra 10 feet; and in the front he inserted a band of sculpture, crowned with a cornice of the time of Nero, but evidently belonging to some other building, and only adapted to its present site.

Turning now to the orchestra and seating, and leaving aside the earlier polygonal orchestra already referred to, there is no doubt that the present one was originally circular, but not concentric with the curve of the seats, having its centre further north than that from which they are struck. The seats are arranged in a semicircle, continued by tangents at the two ends; and in this way a passage which broadens towards the ends is secured, thus affording a greater width near the main entrances, where the number making use of it would be greatest.

All round the orchestra ran a drain 3 feet wide, and from 2′·80 to 3′·60 below the pavement level—open for the most part, but bridged over opposite each flight of steps between the cunei [fig. 19].

The first row of seats was distinct from all the others, and consisted of a series of marble thrones for the use of the priests of the various temples, each having his own particular seat, with his name inscribed thereon; in the very centre is the exquisitely-carved throne of the high priest of Dionysos, which alone of all the seats is provided with socket-holes for an awning. The other concentric rows of seats are all plain and of one pattern, and extended back to the very rock of the Acropolis, which was cut to receive them. The wings, also, which were supported on a great double wall of Breccia and Peiraic stone, connected at intervals by buttresses or stout cross-walls, extend round to the front. A diazoma is formed by the ancient roadway which passed through the theatre itself and led up to the Acropolis.

The Romans, in addition to making use of the theatre for the performance of plays—as is evidenced by their elaborate stage arrangements—also held gladiatorial combats here, and with a view to these latter they inserted a low parapet-wall in front of the series of thrones; they also cut rebates on the stones of the great drain, and fitted loose, movable stones to cover the whole in. They introduced various extra seats and altars in different parts of the theatre, but did not in the main interfere with the

general arrangement of the seating. The seats are divided in places, and allow only 1′·09 per person.

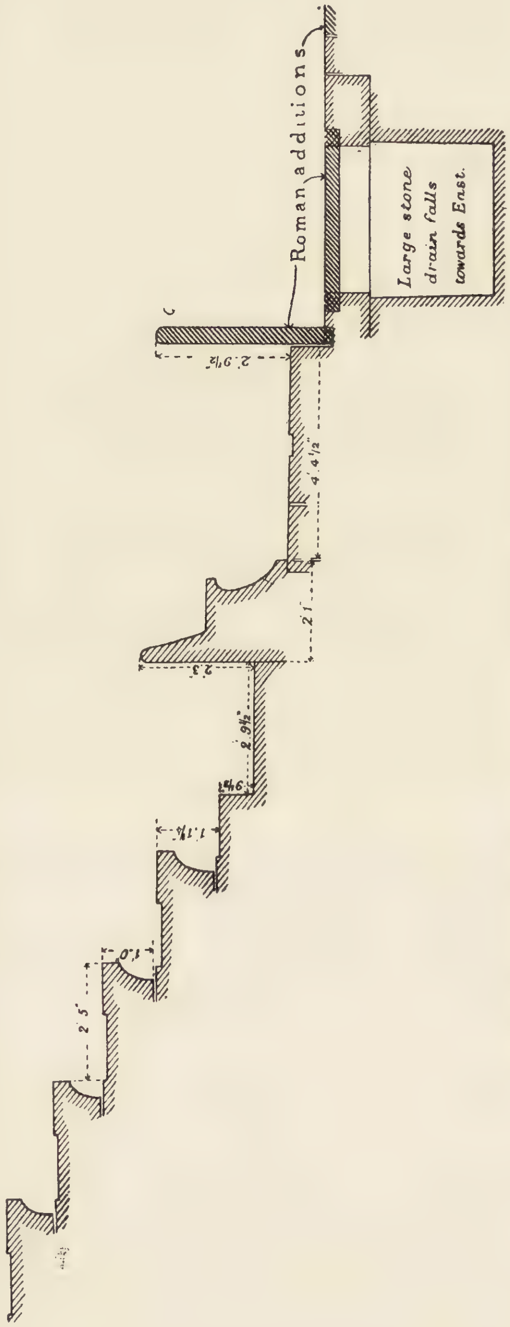


FIG. 19.—SECTION THROUGH SEATS AND PART OF ORCHESTRA: THEATRE OF DIONYSO

Scale: Quarter inch to a foot.

An ancient roadway, as already mentioned, passes through the upper part of the theatre; it leads off, at the east end, down a ramp, and continues behind the great stoa which runs from this theatre to the Odeion. This stoa forms a prominent object in all views of the south side of the Acropolis, and presents the appearance of a great arcade; but the arched construction was not originally visible, having been encased in marble. The construction of this wall is as follows: First, a strong retaining-wall on the Acropolis side; then this arcade, which may have served as a means of keeping the inner wall dry, as much as for any other purpose; and then the casing of marble, part of which is still *in situ*.

This formed the back of the stoa, which faced to the south, and consisted of a double row of columns—the outer one on a plinth of Hymettus marble, the inner one on detached piers. Behind it, but at a much higher level than its floor, ran the road already mentioned as passing through the theatre. Above the road, the numerous small temples and buildings belonging to the Asklepieion were grouped. The stoa dates from the second century B.C., and was over 500 feet long; a series of small openings through the piers of the arcade, near the bottom, and running parallel to the retaining-wall, seem to have rendered access to the interior of the wall at all times possible.

Excavations outside Athens.—The most important excavations that have been carried on in the immediate vicinity of Athens are those at Eleusis. These have been gradually progressing, since 1883, until

their completion in 1886, and a very careful plan was prepared by Dr. Dörpfeld for the *Praktika* of the Greek Archæological Society for that year, though not published till 1888; this plan is here reproduced [Illustn. iii]. I only visited Eleusis once, and cannot pretend to have mastered the very great intricacies of the site; but, thanks to the kind co-operation of Mr. Penrose, I am able to give a brief account of its most interesting features.

Approaching from Athens by the Sacred Way, the first building on this plan that we encounter is the Temple of Artemis, a Roman structure, of which little but the foundations remains. The triumphal arch of the Emperor Hadrian, with a reservoir adjoining it, are also passed before we enter the great Propylæa, constructed on the model of that at Athens, and attributed to Hadrian. We then reach the small Propylæa of Appius Pulcher, a friend of Cicero, built in the middle of the first century B.C., but afterwards altered, and passing through it, leave the small temple of Pluto on our right, together with a broad flight of steps leading up to a platform, from which all traces of building have disappeared. Immediately beyond this is a small treasury, and a temple whose dedication has not been determined; while a long flight of steps leads up to another large temple at a higher level.

On our left we have passed traces of a variety of walls, belonging principally to various lines of enclosure; some of these are very massive, and were built of sun-dried bricks, which have now returned to their native clay, but still display the lines of joints; others are faced with the most carefully-fitted polygonal work, in a very fine black stone; this is not Cyclopean, but of the best periods, and executed with small blocks.

Pursuing the line of the Sacred Way, we come right upon the central feature of the site, and the most complicated problem—the Great Hall of Initiation. Five times has this hall been built on the same site, and five times has it been destroyed; and yet, owing partly, no doubt, to good fortune, but still more largely to the skill and care of Dr. Dörpfeld and those working with him, portions of all have been discovered, and the extent and main features of the four later temples have been determined. It is impossible here, or, indeed, anywhere, except on the site itself, unless aided by most elaborate diagrams, to give the reasons for determining the order of the five temples, which depends on the superposition of foundations and minute details of workmanship; but they may be briefly pointed out [Illustn. iii].

The first temple is of an exceedingly early date, and its remains are indicated by dotted hatching on the plan; and little can be determined as to its extent. Of the second temple, destroyed by Xerxes, the whole plan has been recovered; this was a small hall, with an enclosing-wall and portico towards the sea, and five internal rows of five columns each, indicated by the small square piers which formed their foundations. It is coloured red on plan. This and the three subsequent halls differ widely from the ordinary type of Greek temple, consisting as they do, in each case, of an enclosing-wall with rows of interior columns, in every case uneven in number, thus securing an even number of aisles.

When this hall was first restored, it was enlarged, and treated with a larger and bolder Order ; that is to say, the position of the side walls being the same, instead of five rows of columns, there were but three, indicated on the plan by open circles ; the depth of the hall was greatly increased, so that each row had six columns.

Afterwards Ictinus came upon the scene, and he remodelled and reconstructed the whole on a much grander scale, doubling the size of the building, and dividing it up by five rows of four columns each, of a much larger Order than anything previously attempted here. The hall, which was now almost an exact square, was entered on three sides, by two doors on each side. Around the interior, on every side, ran several rows of steps ; traces of these still remain, but are not shown on the plan, being covered by the later steps formed by the Romans. The bases of six of these columns were found, and are indicated on the plan by large square piers ; fortunately, these are sufficient to leave no doubt as to the arrangement of the interior. To this building also belong the two great diagonal buttresses which appear right and left of the portico, and which served to strengthen the angles where the ground rapidly falls away.

At a later period, the Portico of Philo was added to this hall (321–311 B.C.), and made to harmonise with Ictinus's work ; and this concludes its purely Greek history.

Lastly, the Romans remodelled the interior, and, abandoning the fine bold Order of Ictinus, introduced seven rows of six columns each, without varying the dimensions or position of the enclosing-wall ; they also reconstructed the steps, forming eight rows, which completely surrounded the hall, covering the earlier steps, and affording accommodation, it is calculated, to nearly three thousand spectators. The ruins of this structure are those most apparent at the present day ; the earlier work can only be made out with much trouble and a good plan, or under competent guidance. Part of this later structure was discovered by the excavations made at the instance of the Society of Dilettanti between 1811 and 1814.

Flights of rock-cut steps on either side of the great hall lead up to a broad terrace above the hall itself, and immediately under the rock of the Acropolis. The south-west side of the site contains remains of an extensive Roman stoa, or portico ; part of it is built over the site of the council-chamber of earlier date, which consisted of three chambers, and which itself, in part, occupies the site of a still earlier structure.

The Museum is a mere shed, quite unworthy of the site and its contents ; but a more suitable structure is to be erected now that the work of excavation is finished.

Dionyso.—The American School carried on excavations in the early part of the year at a spot called Dionyso, in the exquisite wooded valley to the north of Mount Pentelicus, and in full view of the plain of Marathon, with considerable success. On the invitation of Professor Merriam, the Director of the School, I went out to see the works shortly after they were started.

The site had, when work commenced, the ruins of a Byzantine church of small dimensions, which was demolished. Its apse consisted, undoubtedly, of Greek work, and at first it appeared to be *in situ*, with the church built up to it ; but on examination it

proved to have been rebuilt with Greek materials, and the probability is that the Greek building originally faced the wrong way for church purposes, and was simply pulled down, and rebuilt very near its original site.

Nearly the whole of the stones of the original building, either re-erected in the apse or buried hard by, were discovered, and the lintel bore an inscription—which had been previously seen and read by Chandler—setting forth that it was a choragic monument. It consisted of a semicircular building, terminated with square pilasters, which carried an architrave, the whole being roofed by two thin slabs, each of quadrant form, carefully fitted to the outline of the building, moulded and throated.

The plan can be restored with great accuracy, and there can be but little doubt as to the section [figs. 20 and 21], though the building may possibly have been a course

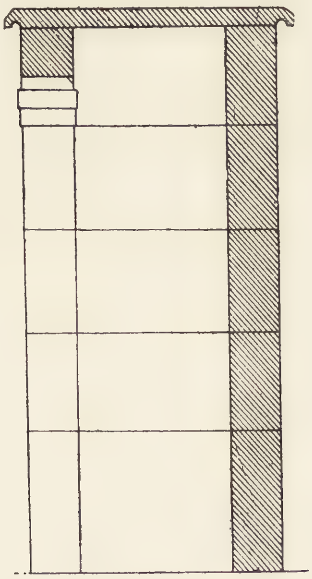


Fig. 20.—Section through Choragic Monument.
Scale : Quarter inch to a foot.

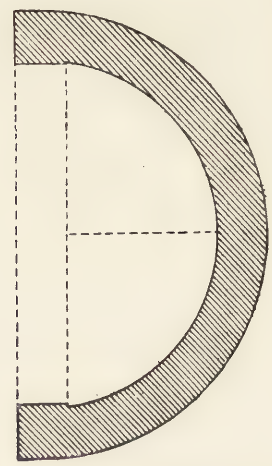
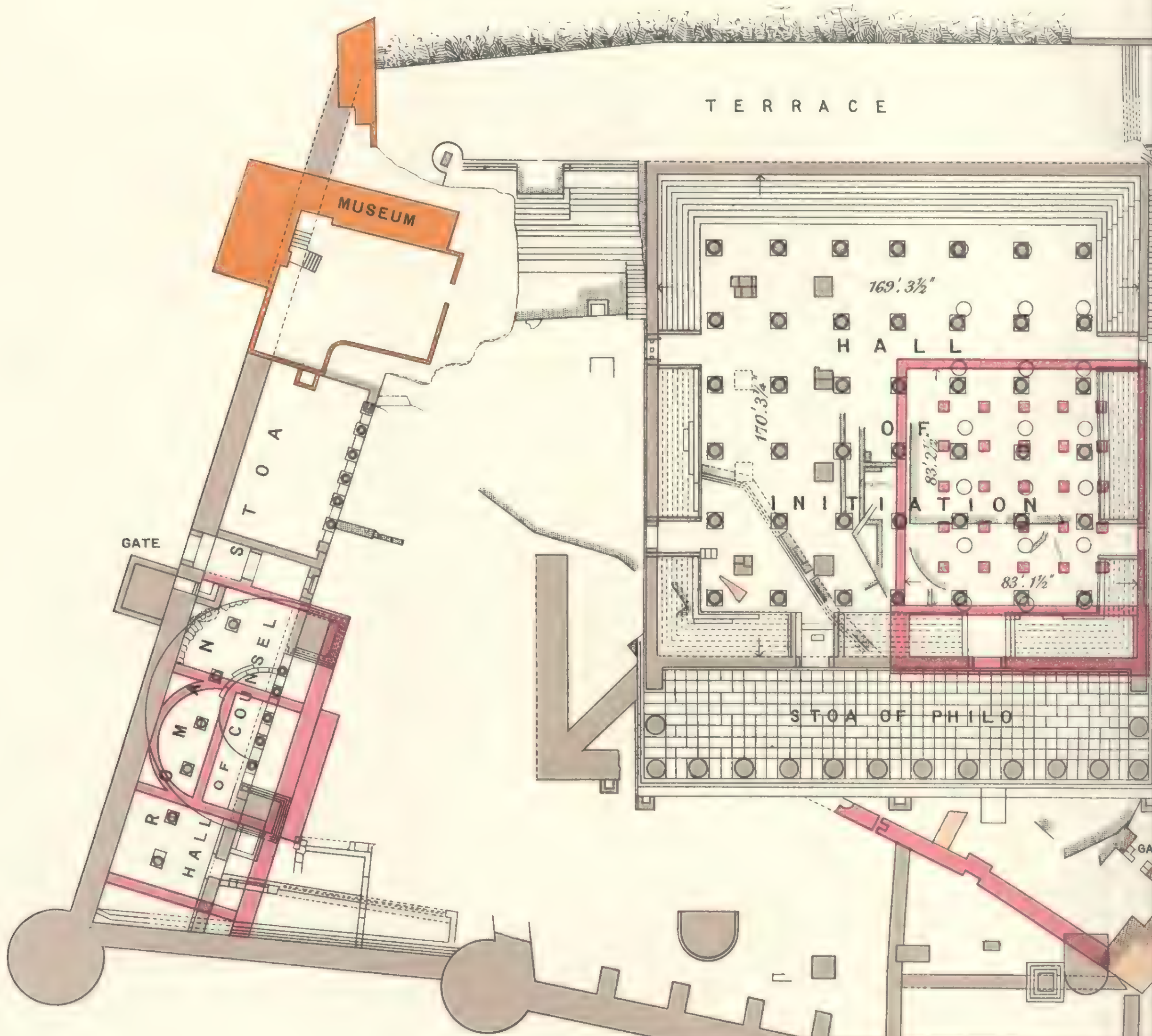


Fig. 21.—Plan of Choragic Monument.

higher; but the stones necessary for constructing the five courses shown have been nearly all recovered. The material is a grey limestone, very hard and durable, and carefully worked, and set without mortar, even in the Byzantine church. There is nothing in the way of mouldings to indicate any further finish to the roof; in fact, the marks in the upper surface of the roofing-stones seem to indicate that they were the sole finish. An Acroterion was discovered, of similar material, which appears to have been re-used in Christian times, for a rude attempt at a crucifix seems to have been cut in over the Greek work.

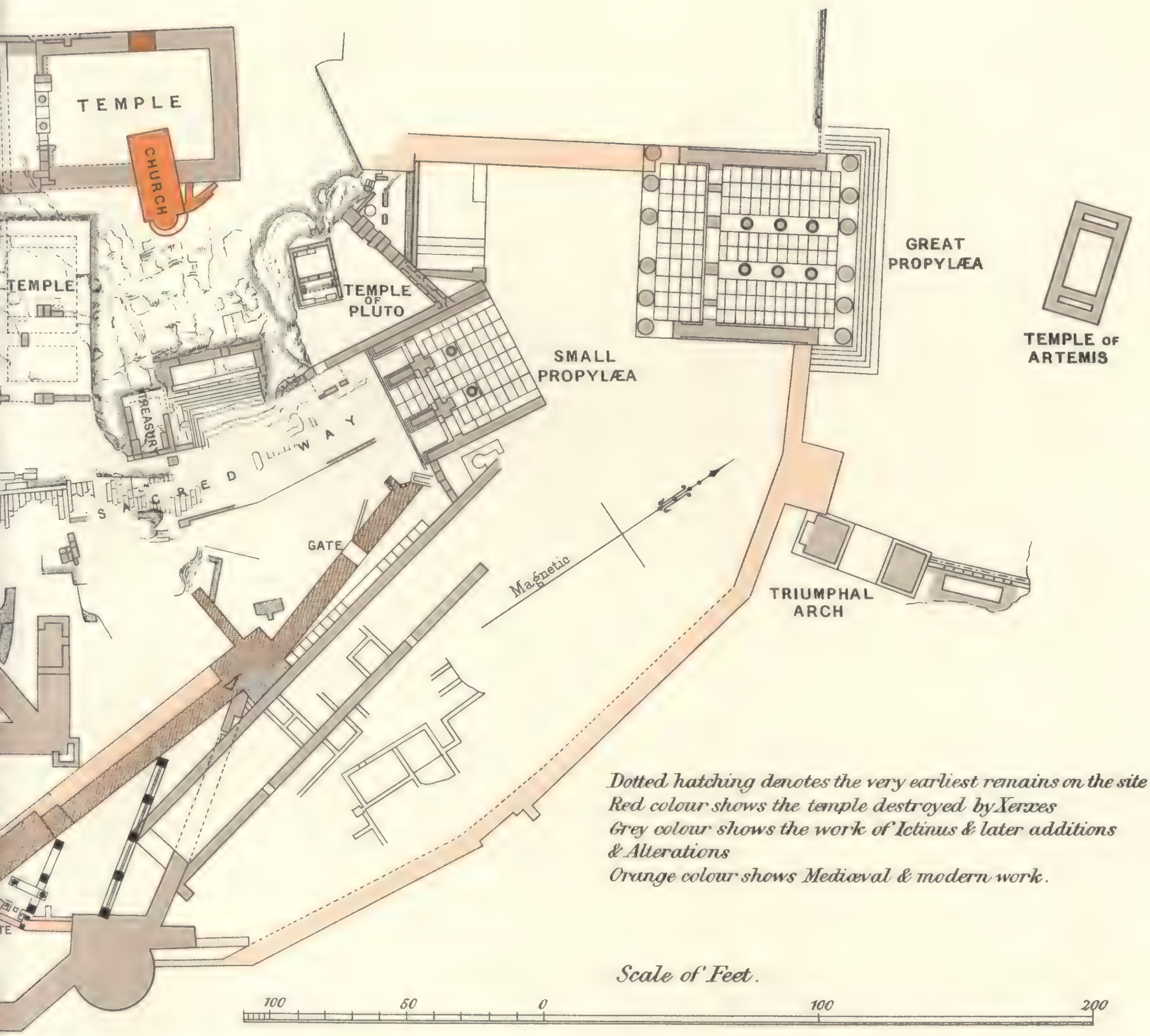
In the Peloponnesus I visited Ægina, Epidauros, Mykene, Tiryns, Bassæ, and Olympia. Most of these sites have been so thoroughly illustrated and described in various monographs that there is little left to add; but at Epidauros and Mykene recent excavations have been carried out which deserve some attention. My visit to



Reproduced from Dr. Dörpfeld's Plan
in the Journal of the Greek Archæological Society, 1887.

PLAN OF EXCAVATIONS

[see p



AT ELEUSIS, 1885-1887.

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C F KELL LITHO. 8 FURNIVAL ST HOLBORN, E.C

From a photograph by R. Elsey Smith.

THE THOLOS

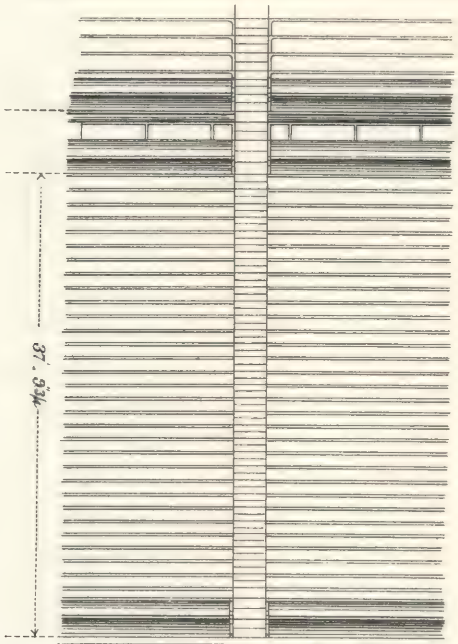
MARBLE CAPITAL FROM THE CORINTH

[See pages

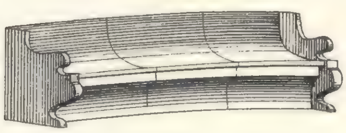
EPIDAUROS.

ORDER OF THE INNER PERISTYLE.

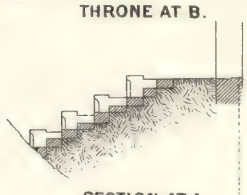
nd 67.]



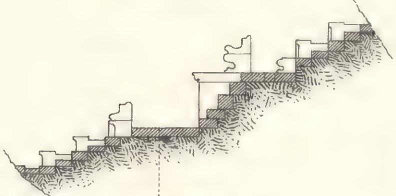
DETAIL ELEVATION
OF CAVEA.



THRONE AT B.



SECTION AT A.



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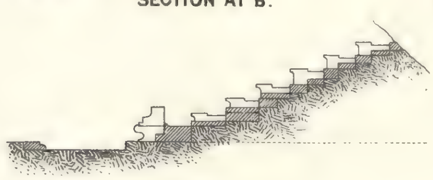
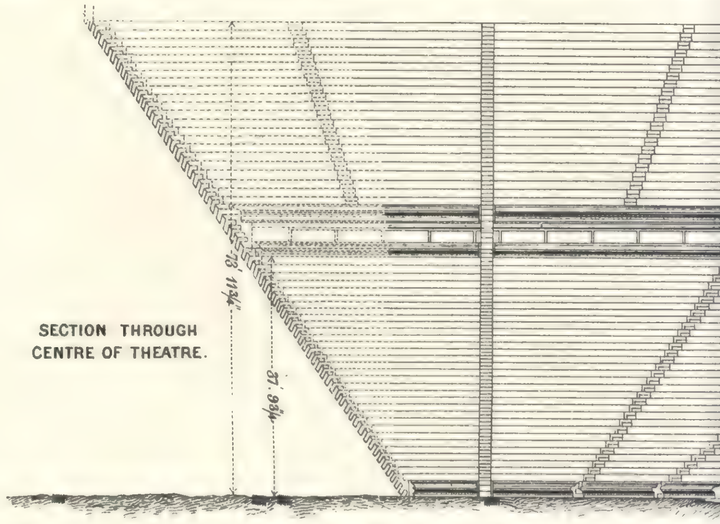


SECTION AT C.

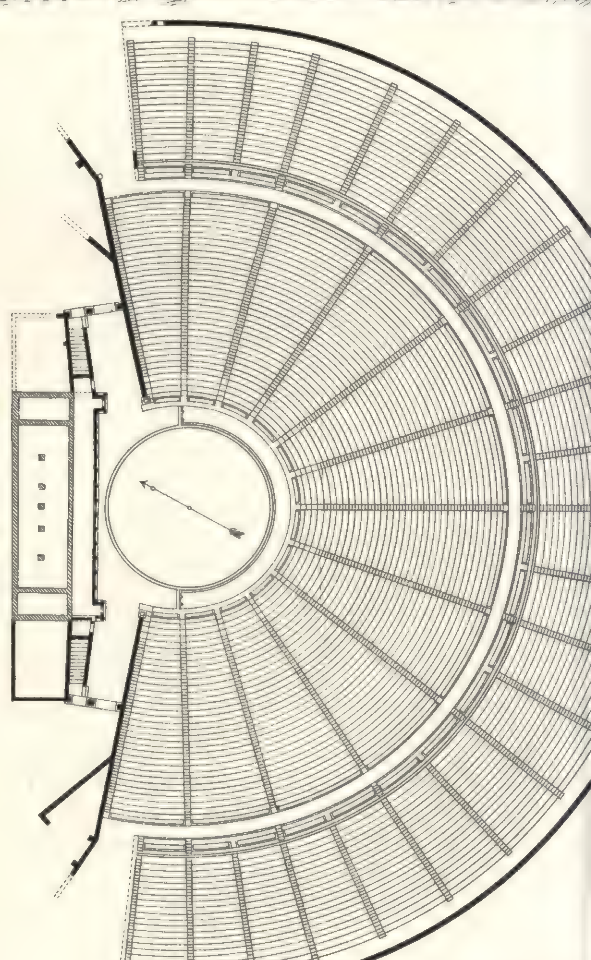
Scale of Feet for details.



SECTION THROUGH
CENTRE OF THEATRE.

GENERAL PLAN OF THEATRE.

Scale of Feet.



THE THEATR

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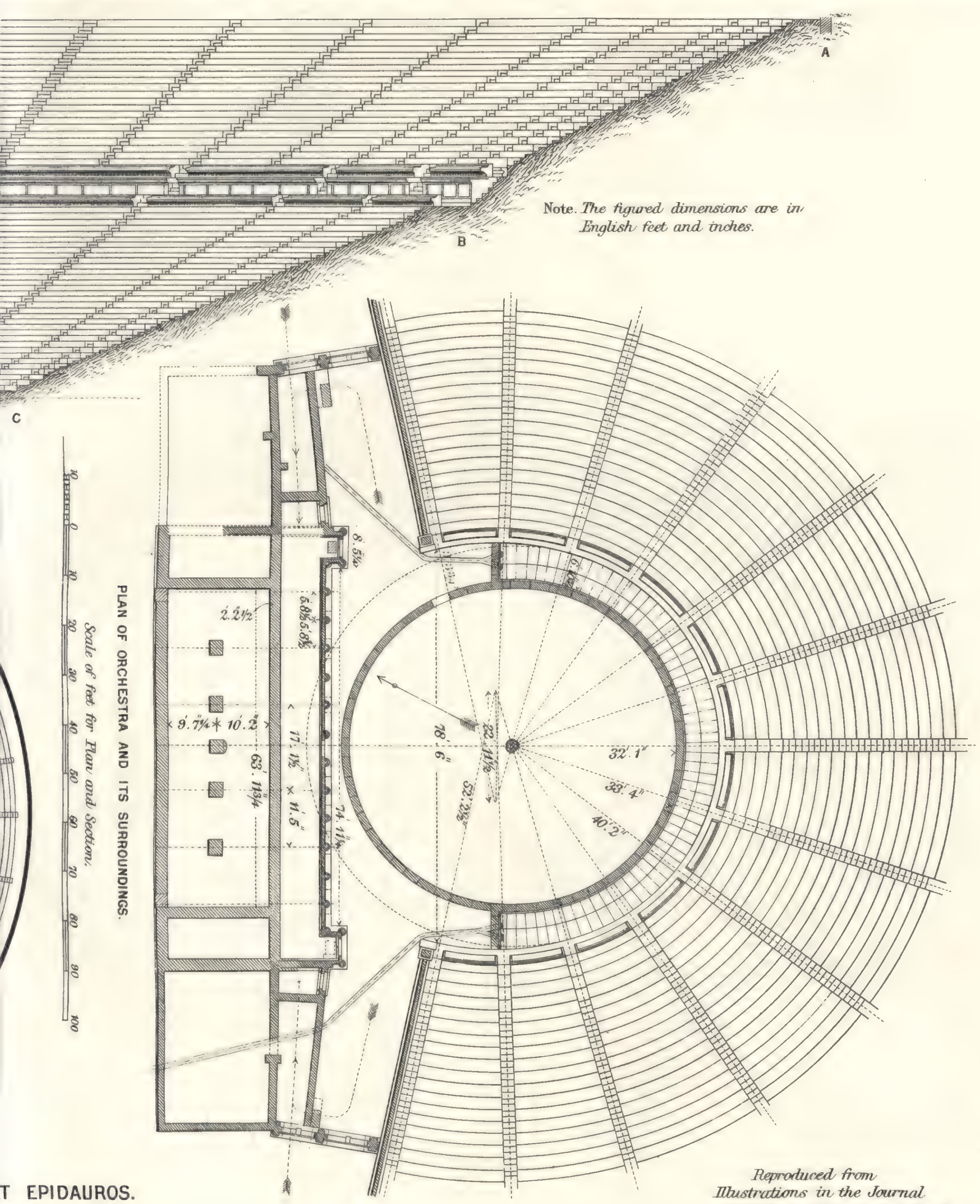
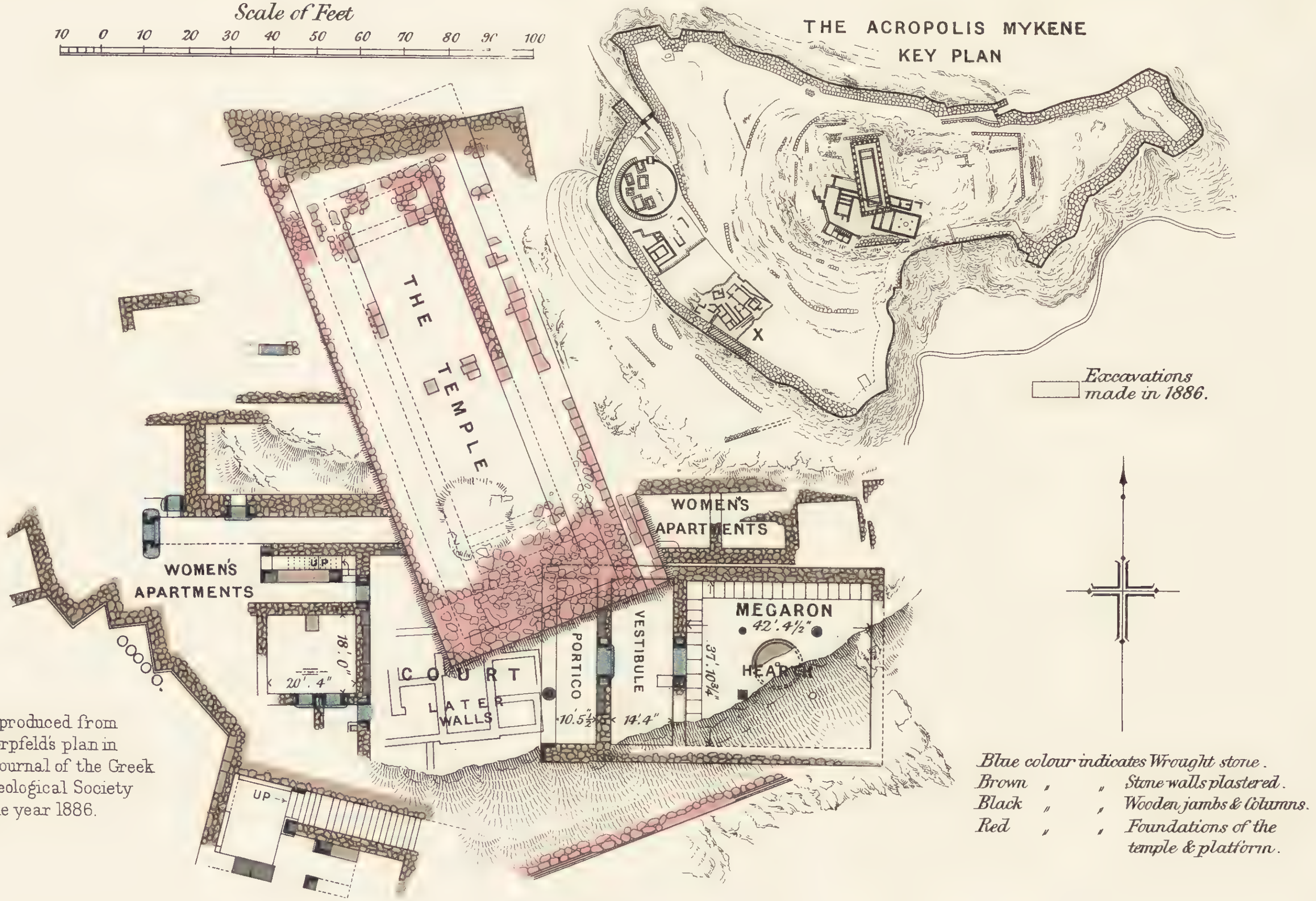
BRITISH ARCHITECTS, VOL. VI. NEW SERIES.
GREECE AND CYPRUS. (v.)



T EPIDAUROS.
53, 54.]

Reproduced from Illustrations in the Journal of the Greek Archæological Society for the years 1881 and 1883.



Reproduced from
Dr. Dörpfeld's plan in
The Journal of the Greek
Archæological Society
for the year 1886.

Blue colour indicates Wrought stone.
Brown " " Stone walls plastered.
Black " " Wooden jambs & Columns.
Red " " Foundations of the temple & platform.

PLAN SHOWING FOUNDATIONS OF THE PALACE AND TEMPLE RECENTLY EXCAVATED AT MYKENE.

[see pages 54-57.]

C F KELL LITHO. 8. FURNIVAL ST HOLBORN, E.C.

each of these places was a hurried one, and I have supplemented the notes made on the spot by information gleaned from the Journal of the Greek Archæological Society, from which publication the illustrations of these two sites have been reproduced [Illustns. v, vi].

Before passing to the detailed consideration of these sites, there is one point which I observed in the Temple of Apollo Epikourios, at Bassæ, and which may be worth recording. I noticed a peculiarity in the fluting of the internal Ionic Order which is not referred to or shown in Professor Cockerell's monograph,* nor, as far as I am aware, in any publication. In the first place, two entirely distinct sections of fluting are used, of which full-size drawings are given [fig. 22]. The one lettered S[1] is used on the east side of the temple for the fluting of the second and third columns from the north end, and on the west side for the first, third, and fourth from the north end, also for both the diagonally placed columns; while the section S[2] is used for the first and fourth on the east side, and for the second on the west. A further peculiarity is that

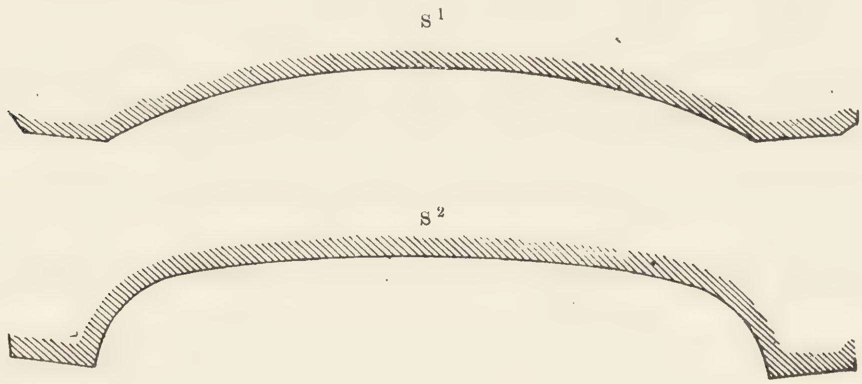


FIG. 22.—FULL-SIZE SECTIONS OF THE FLUTING TO IONIC COLUMNS IN THE CELLA AT BASSÆ.

up to the height of 5·20 feet from the floor level no alteration in the size of the flute takes place in either case, the diminution due to the tapering of the column taking place entirely in the fillets which occur between the flutes, and which at this height die out and become arrises.

Epidauros.—At Epidauros the two most striking buildings are, at the present day, the Tholos of Polykleitos, which stands near the Temple of Asklepios, and the Theatre. The foundations of the former are *in situ*, and consist of six concentric rings of masonry, the three outer ones very massive, the inner comparatively slight. The four inner walls are connected by a cross-wall, and form passages, and the doors from one to another are so arranged, on alternate sides of this wall, that the whole length of each passage must be traversed before the centre is reached. Much of the superstructure remains scattered about the site, but nothing above foundation level is in place. The building was peripteral, having a peristyle of twenty-six Doric columns on

* *Temples of Jupiter Panhellenius at Ægina; and of Apollo Epicurius at Bassæ, near Phigaleia, in Arcadia*, fo. Lond., 1860.

a stylobate of three steps. The circular wall behind these columns had a doorway facing due east, and inside this was another peristyle of fourteen Corinthian columns; a cap * belonging to one of these inner columns, of exquisite design and workmanship, and almost perfect, stands in the adjoining Museum [Illustn. iv].

The Theatre [Illustn. v] is one of the most perfect in Greece, and a very fine specimen; it is of exceptional interest, as it appears not to have been altered by the Romans, but to retain the original Greek arrangement. It will be noticed that the circle of the orchestra is complete, and nearly on a level with the sill of the architectural scene; it is, therefore, evident that there can never have been any raised platform or stage, which would have cut off the lower portion of the scene, with the bases, some of which are actually still in position in witness of their original level. Doors led through this scene to a series of passages and chambers in the rear, for the use of the performers; and a passage on either side, terminating in double doors, gave access to the seats at the orchestra level, as at Athens and elsewhere.

The cavea is almost perfect; it is struck from three centres, the central portion having the same centre as the orchestra, while the sides have a longer radius, so that here, as in the Dionysiac Theatre at Athens, we have a passage widest at the entrance doors, and gradually, but regularly, contracting as the side flights of steps branch off it; though this characteristic is not so strongly marked here as at Athens. The cavea is divided by a diazoma into two portions: the lower has thirty-two rows of seats, divided into thirteen cunei by twelve flights of steps; the upper part has twenty rows of seats, and at the top measures 360 feet across. The first, thirty-second, and thirty-third rows of seats are specially treated, being divided up into groups of thrones with arms and backs, but not so elaborately as at Athens.

Mykene.—At Mykene recent excavations have brought to light extensive remains of a palace on the crown of the hill, within the last line of fortification; this, though it is not so complete as the palace at Tiryns, is of considerable extent and of great interest. The plan of at least one house of more modest dimensions has also been recovered.

Remains of three distinct epochs are found on the palace site:—(1) Early walls coated with plaster, similar to the walls of the palace at Tiryns, and probably of about the same date; (2) Later walls, on the same foundations, but not plastered, of a poorer epoch, but, Dr. Dörpfeld says, earlier than the sixth century B.C., for we find (3) traces of a temple with a roughly-formed base of stone, backed with earth, which is itself of a date not later than the sixth century B.C., when the citadel walls were destroyed by the Argives; and this foundation extends over the remains of the later palace [Illustn. vi].

The ancient palace, of which alone I am able to give any complete account in this Paper, was approached by a flight of steps 7′ 10½″ wide, and with 4″ to 5″ risers, clearly showing signs of careful repair with cement at two or three different epochs. The

* The main dimensions of this cap are:—Height, including abacus, 2·11 feet; greatest width of abacus upper edge, 2·65 feet; least width of abacus upper edge, 2·125 feet.—R. E. S.

upper part of the flight is destroyed, and so is the entrance to the main court; but part of a great sill, 6′ 1″ broad, 1′ 3¾″ thick, lies near the top. The original length of this sill is not ascertainable; it has a smoothly-worked surface, 11″ broad, at one edge, and one socket for a door-hinge, 4¾″ in diameter. The walls of the court itself are from 14″ to 2′ 0″ thick, and show no traces of fire; its length is 38′ 11″. The lower part of the walls is plastered, sometimes in two thicknesses, and above, the walls are faced with large stones; on the north, east, and west sides six equal courses of these stones are standing, making a total height of 7′ 10½″; a course of bond timber is used between the first and second courses, and again at a higher level. The lowest course of stones has a rough upper surface, but a bed 10⅝″ broad is worked smooth; and in each stone this bed contains a dowel hole, about 2½″ square and 2⅜″ deep, for fixing the bond timber.

Separated from the court by two columns between antæ is the stoa or portico, 10′ 5½″ wide in the clear; and the stone base for one of these columns was found in position. From the stoa a door led into the vestibule, the sill of which remains; this is provided with square sinkings for door-posts, and a circular hole for the pivot of the door, in which was found part of a brazen hemisphere for the bottom of the pivot, as at Tiryns. The floor of the vestibule, which is 14′ 4″ wide, was cemented in the centre, but round the edge it was paved with stone for a width of 3′ 3″. From the vestibule an opening led into the principal men's apartment, or Megaron; as in the same situation at Tiryns, this opening was not provided with a door, but merely with wooden jambs.

The Megaron, a great covered hall, is larger here than at Tiryns, and measures 37′ 10¾″ × 42′ 4½″. The roof was supported on four wooden columns, 15¾″ in diameter, standing on stone bases, three of which were discovered about 4″ below the floor level; near them were found fragments of bronze plates, intended probably for covering the columns. Between the bases, and no doubt under an opening in the roof, there exists a large circular hearth of clay, with a raised rim, 11′ 1¾″ in diameter. The hearth is 6″ above the floor level, and the whole, including the rim, which has a rebate, has been plastered with five separate layers of plaster, each of which was decorated with painting; so that they are evidently not contemporary, but succeeded one another [fig. 23]. The floor of the Megaron is of plaster or cement, divided by double incised lines into large squares, except against the walls, where we get a flagged border, 4′ 1¼″ broad.

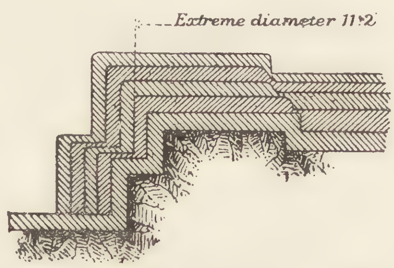


Fig. 23.—Section through Rim of Hearth.

On the west side of the great court there is an opening intended for a door, which leads through another opening into an inner court, or hall, 18′ × 20′ 4″, which is entered separately, from another direction. Against the north wall of this court is a hearth, 3′ 5¼″ × 2′ 7½″, raised 2″ above the level of the floor, which is of concrete. Beneath the floor runs a rectangular watercourse of terra-cotta, 8″ deep by 8⅝″ wide; it falls from east to west, and was covered by thin stone

flags. Another opening on the west side of the great court, but nearer to the north wall, and without a door, led out of it. Just beyond this opening a flight of steps ascended, probably to an upper floor; the three lowest steps of this flight, 3′ 3″ wide, were of sandstone, covered with two layers of plaster. The third of these steps forms a half-landing, and above this point the stairs were of wood. Passing the staircase, we reach a large irregular space, from which nearly all traces of dividing-walls have now vanished, but which probably included several apartments; it communicated with a store-house under the stairs, and probably with a long passage running east and west, which was, however, certainly entered at its western extremity by a door, and gave access to chambers to the north of it, one of which at least was at a higher level. One of the fortification walls, of irregular form, stops close to the entrance to the passage, and near it passed a road from the north-west—so that this may have been a separate entrance from the outer enclosure; while another door to the south may have communicated with the parts already described.

The passage itself had a concrete floor, and, running along the north side of the great court at a considerably higher level, and without communication, led to a group of rooms at its east end; doubtless there may have been other rooms to the north of it, obliterated by the later temple—and the whole of this portion formed the women's apartments. The first room entered at the east end, of which we have remains, had a concrete floor, and, on its south side, a seat (?), formed, like the hearth, of clay, 1′ 3¾″ wide and 7⅞″ high; but the hearth was found against the north wall, 2′ 2¾″ long, and near it were found three golden beads and objects of crystal. From this room was entered, apparently by wooden steps, a small room at a higher level (13′ above the men's apartments at least) which had no concrete floor. The east wall gathers over, as if for a vault. There are remains of another chamber, but no trace of the entrance to it, which was probably from the north; the floor of this was not concreted, but the walls were painted. This, no doubt, was part only of the palace, the full extent of which cannot be determined; but the remains, such as they are, seem of great interest, repeating, as they do in the main, the general scheme of the palace at Tiryns.

Little use seems to have been made of bricks, either dried or baked, in the building, though they do occur in the north wall of the Megaron. The stones forming the walls were of no great size, and timber bond was used, as already mentioned. The walls were plastered, and decorated with ornamental, coloured bands, the lowest 2′ 9½″ high from the floor, with others above it, the bands being divided up into sections. The roofs appear to have been flat, and formed of clay or concrete laid on thatch or reeds, marks of which are found in some of the fragments that have been recovered. The sandstone used is similar to Poros stone, and is still quarried within an hour and a half of Mykene.

The plan of a smaller and less elaborate house [fig. 24], which may have been a private dwelling, has also been found lower down the hill, and this repeats the general arrangement of the palace. Here, again, we find the outer court entered by a gate, giving access, through a vestibule, to the Megaron, with its central hearth, and also to

another small chamber; while outside the court a flight of thirteen steps leads down to a passage 9′ $2\frac{1}{4}$″ below, from which three rooms, probably used as stores, are entered. The women's chambers, it is supposed, were over these, and at the same level as the court, but with a separate entrance from it. The construction of the walls is similar

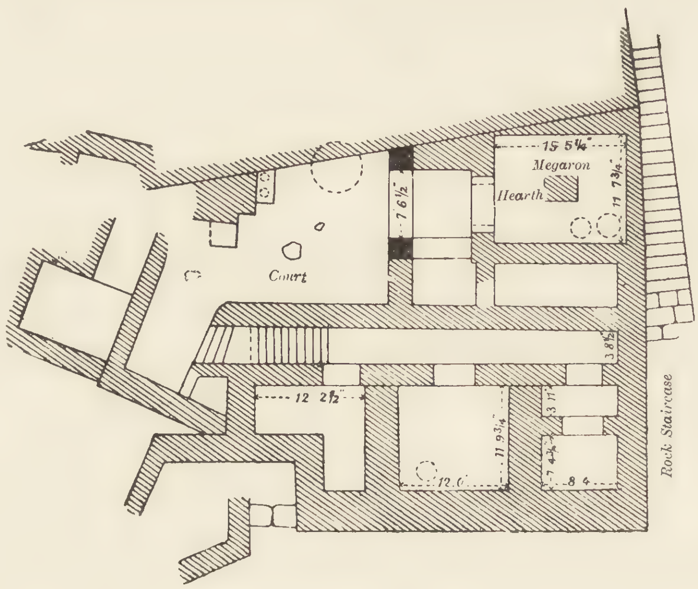


Fig. 24.—House at Mykene.

See key-plan, Illustn. vi, letter x.

to that of the palace walls, but the floors are of beaten clay; the walls were plastered and painted, but only a few fragments were recovered. I must, in concluding this part of my subject, express my indebtedness to Mr. J. S. Furley, of Winchester, who visited the site with me, and gave me most valuable assistance in translating the account given in the Journal of the Greek Archæological Society.

CYPRUS.

I propose, further, to give a short account of the work carried on by the Cyprus Exploration Fund during the early part of the year 1888. The first site was explored before my arrival, but I subsequently visited it; this was the hill-fortress of Leondari Vounò, rising abruptly out of the great plain of the Mesoréa, a few miles from the capital, Nikosia. This rock was the site of an early settlement and fortress, which is proved by the rock-cut tombs and very early pottery; but the massive remains of a fortress which crown the hill date from Crusading times.

The main work of the season, however, consisted in the exploration of the site of the famous Temple of Aphrodite, at Palæo-Paphos, now occupied by the modern village of Kouklia. The selection of this site for the main work of the season was due to its

great fame, and to the fact that the position of the temple was well marked, and time would not be lost in searching for it.

Almost immediately after my return to Athens from Mykene I received an intimation from Mr. Ernest Gardner, who—with Mr. D. G. Hogarth, of Magdalen College, Oxford, and Mr. M. R. James, of King's College, Cambridge—had been some while in Cyprus, and was directing the excavations there, that they were at work on the Temple of Aphrodite, at Palæo-Paphos; and requesting me to join them to assist in the preparation of the plan. The date of the departure of the next steamer just allowed me time to pack up, and purchase a few necessary articles, such as a washhand-basin and blankets—not to be procured in the island—and then I left the Piræus for Smyrna, reached after a somewhat stormy passage, due, in all probability, I was informed by the steward, to the fact that the Archbishop of Smyrna was on board. At Smyrna I had the first glimpse of truly Oriental life, with which I was to become more familiar in Cyprus, and to see very completely, and but little influenced by a more Western civilisation, in the intensely picturesque and interesting town of Nikosia.

At Smyrna I had to wait for the steamer from Constantinople; but though we left the Archbishop behind, the weather did not improve, and we anchored off Limasol very early one morning, after a most unpleasant voyage—a voyage which, as I found when I came to leave Cyprus, can be one of exceeding beauty, for the steamer keeps near the western coast of Asia Minor, threading its way through the islands, and, passing within sight of Patmos and Halicarnassus, touches at Rhodes and Scio.

From Limasol a road starts in the direction of Paphos, but abruptly terminates after a seven-mile course, and thence there is nothing but a mule track. Early the following morning I started, I confess with some misgivings, on a mule-ride of thirty-five miles, with two mules—one for my baggage and muleteer, the other for myself—and I was provisioned for the journey. My muleteer was ignorant of any language but Cypriote Greek, so that there was not much chance of conversation; but the ride was a most interesting one, through a constantly changing country, with the sea appearing on the left hand whenever we climbed some ridge out of a deep valley.

The distance should have been traversed in a day; but owing to delays caused by the baggage, and the mules not being fast, nightfall found us several miles from Paphos, and we had to put up at a little khan, where black coffee and bread, and a preparation of soured milk, were the only provisions. Fortunately, I had my bed with me, but there was but one room, and its other occupants mostly curled up on the floor round the fire. Long before sunrise every one was astir, and after more coffee and bread, and the payment of two shillings for the accommodation of myself, the muleteer, and the mules, we got under way again, and reached Paphos between seven and eight. I first caught a distant glimpse of the village some miles away; then the track descended into a deep valley with a little watercourse, and, ascending a very sharp incline, starting almost from the sea level, rose rapidly till I suddenly came upon the scene of very active operations, which I reached in time to hear of the discovery of six or seven new inscriptions.

The first sight of the temple was to me disappointing after the glories of Athens—the ruin was so complete—and it was only after considerable care in preparing the plan that we were able to form a distinct idea of it. This, I think, will be understood from a glance at the plan [Illustn. vii], the extraordinary irregularity of which, combined with the very fragmentary condition of the walls, made its realisation on the site a by no means easy task. But I will endeavour now to give some connected account of the result of the season's work.

Kouklia stands on high ground, about a mile and a half from the sea. The site of the temple was partly clear and partly occupied by houses, and has a considerable slope towards the sea. We lived in the village, close to the works, and had no trouble with the workpeople, of whom at one time we were employing as many as 230—men, women, and children; and very bright and picturesque the whole scene was when they were engaged in long rows carrying out the earth. The overseers, like the workmen, were partly Greeks and partly Turks; and a good deal of work was got through in the long day from sunrise to sunset. The rock was found usually from three to five or six feet below the surface, though in places, especially in the Great Court, it was deeper; and the whole site was cleared down to the rock level. The history of the temple, the method of carrying on the work, and the results, including copies of all the inscriptions, will be found fully described and discussed in the *Journal of Hellenic Studies.**

We were enabled to recover to a very considerable extent the plan of the temple, though it is not by any means as perfect as could be desired, and is complicated by the presence of work of widely different epochs, and by the fact that we possess no accepted model for a large Phœnician temple to help us in settling any problems that arise. Neither have we any sufficient description of the temple in classical writers to assist in its restoration; and the curious representations of it on the coins of Vespasian, Domitian, Trajan, and Caracalla, are not sufficient, in the absence of any actual superstructure remaining on the site, to clear up the question.

The entire superstructure seems to have been swept from the site, and this thorough clearance appears to have taken place in quite remote times. We found, it is true, several drums of Roman Doric columns, caps, and fragments of cornices, and a few moulded blocks of a better period; but they are only scattered fragments, and do not enable us with any accuracy to restore the earlier and more interesting portions of the structure as regards their elevations or sections.

We have far more material for the reconstruction of the plan; but this has been greatly modified at different times, and is curiously irregular as regards the orientation of the different parts. Though great changes have been made, however, it does not seem that either Greek or Roman ever attempted to destroy the Phœnician type of plan, or to convert it into a typical Greek or Roman temple. We find, then, the plan roughly divided, both by its form and the character of work, into two main divisions: a large and, roughly speaking, quadrangular court, about 210 feet each way,

* Vol. ix., No. 2, October 1888, "The Temple of Aphrodite: its Architectural History and Remains," by R. Elsey Smith, pp. 193–202, and "Results of the Architectural Evidence," by E. A. Gardner, pp. 203–215.

subdivided into smaller courts or chambers; and a building, the remains of which are imperfect, standing to the south, and the exact connection of which with the other, a larger portion, is not very evident.

In each part we find remains of Roman work mingled with earlier work, which is quite distinct in character in the two great divisions. In the southern division (called on the plan the south wing) we find the remains of two very massive walls, forming, apparently, part of the south and west walls of a large court; the foundation of the north wall also exists in part. These are constructed of very large and well-squared blocks, accurately bedded, and fitted upon a foundation of large polygonal work with a carefully finished top bed. This bed in the west wall is not level throughout, but stepped twice, while the stones standing on it have their upper beds all approximately level. Another point which, in conjunction with the very large size of these blocks, distinguishes this from the other parts of the temple, is the presence in almost every stone of one or two holes bored through the angles for the purpose of hauling them; these holes are all carefully arranged so as to be concealed from view when the work is complete [fig. 25]. The stone employed is a limestone, and must have been brought

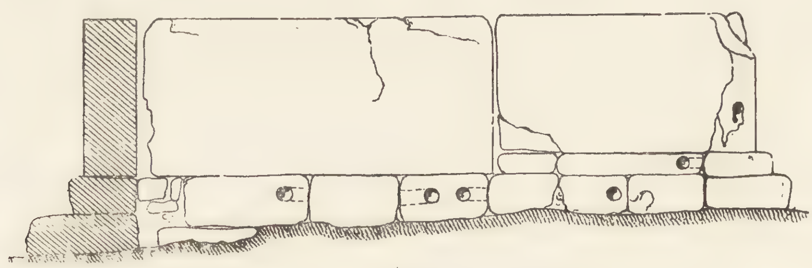
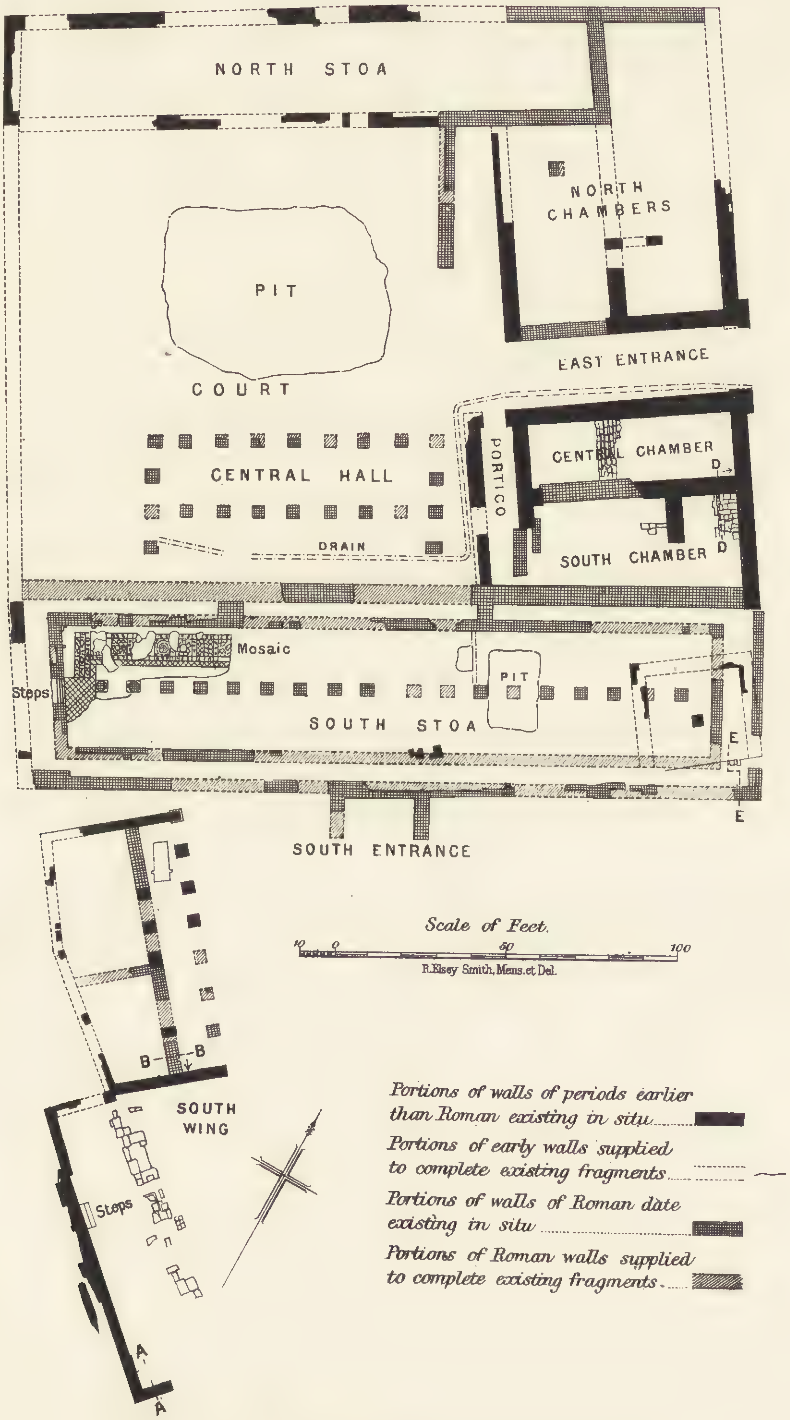


Fig. 25.—The First pre-Roman Period. Section A A, see Illustn. vii.
Scale: 8 feet to an inch.

from a considerable distance. About 50 feet from the south-west angle, square sinkings for a small door are found; and this is the only case throughout the temple in which we have found a door-sill in position, and been able to absolutely fix the entrance to any part of the building.

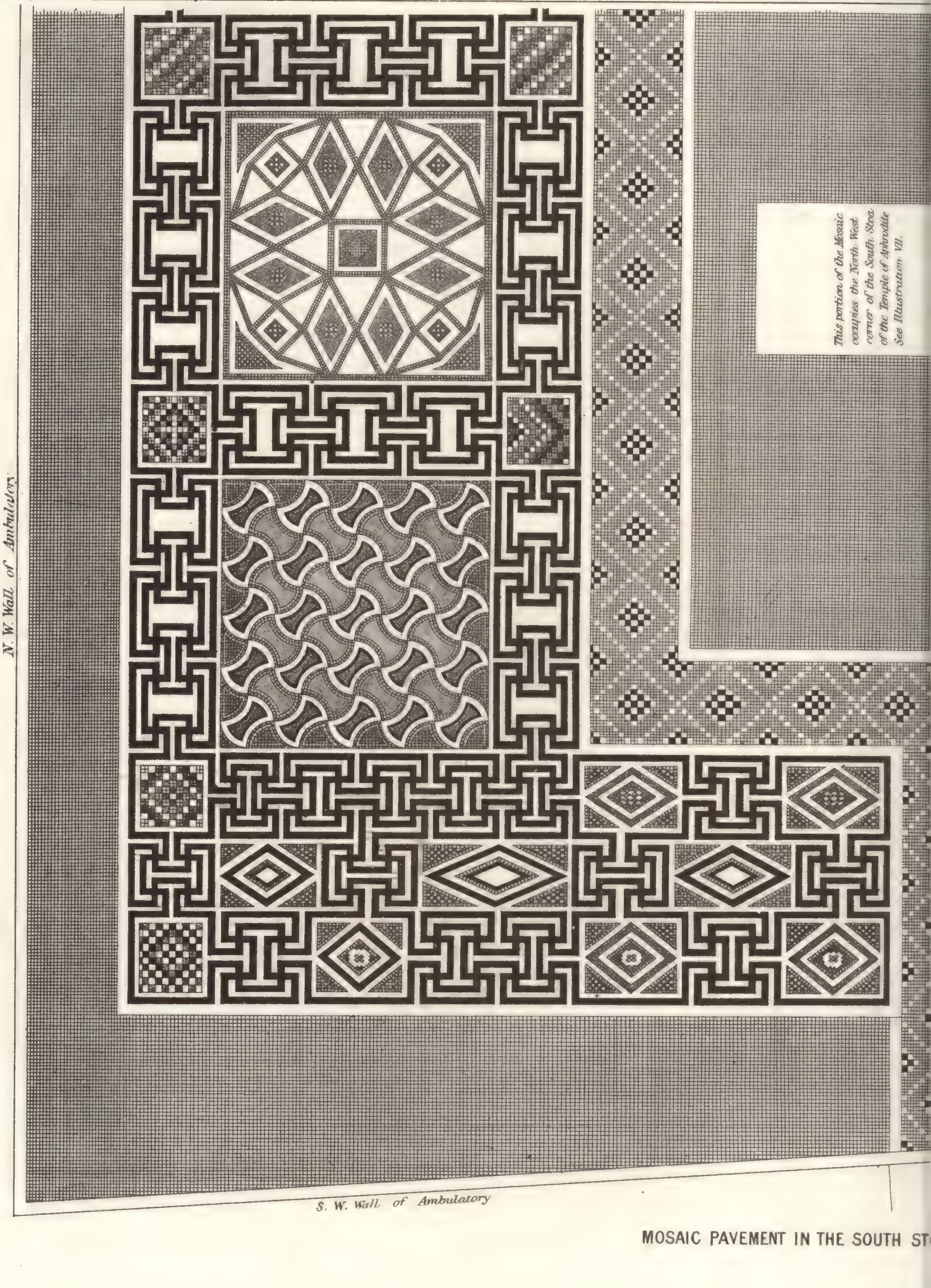
North of this portion, and before reaching the great enclosure, we have more remains, but of a totally different character, and differently orientated. These portions are considerably mixed up with Roman work, and we have evidence of three enclosing-walls (north, west, and south); there may also have been an east wall, but no trace of it remains. The west wall is irregular in shape, having a bend in its course; and the stones employed are much smaller, carefully squared and fitted, and each stone has on its front a raised panel, formed by a broad draught running round the upper edge and the two sides. In addition to the walls, there is a series of square monolithic bases, in two rows, on one of which a square monolithic pier still stands; its surface is treated with panels similar to those described in the foundations, and at the top it is apparently prepared for the reception of lintels or architraves [fig. 26]. In the passage-way formed by this double line of bases, and in the northern half, a curious excavation in the rock



TEMPLE OF APHRODITE, PALÆO-PAPHOS, CYPRUS.

[see pages 59-64]

C. F. KELL, LITHO, 8, FURNIVAL St HOLBORN, E.C.



MOSAIC PAVEMENT IN THE SOUTH ST

BRITISH ARCHITECTS VOL.VI. NEW SERIES.
GREECE AND CYPRUS. (viii).

OF THE TEMPLE OF APHRODITE, PALÆO-PAPHOS, CYPRUS.

[see page 63.]

occurs, 11′ 6″ long, averaging 4′ 6″ wide, and about 2′ 0″ deep; in the bottom is a small circular sinking, 9½″ deep, and in each side there is a groove extending the full depth. It is difficult to determine the exact use of this excavation; it may have formed a bath for some ceremonial purification, or been connected with a sacrificial altar, but there is no kind of outlet to it. This building may have originally been a portico with a double colonnade facing east, but it appears at least possible that it may be the remaining half of what was originally an important approach from the north. The back row of piers seem to have been filled in with masonry, in Roman times, so as to form enclosed chambers.

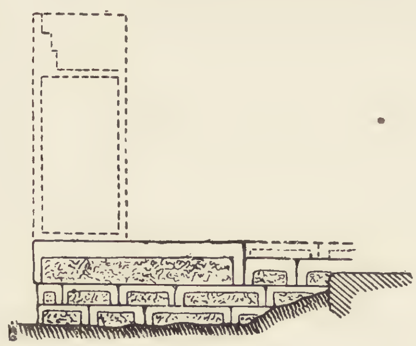


FIG. 26.—THE SECOND PRE-ROMAN PERIOD.
Section B B, see ILLUSTN. vii.
Scale: 8 feet to an inch.

It seems to me that this group of buildings comprising the south wing probably formed the original temple, or sacred enclosure, which, like the temple represented on a coin from Byblos, may have been merely an open court enclosed with walls, and containing the sacred cone and an altar, and having a portico or approach. Two quite distinct epochs seem to be represented in the work, and from the character of the masonry, if from no other reason, it seems likely that the court, with its massive walls, is the older. The pre-Roman work in the larger division differs, however, as we shall see, from any found here, and is therefore not likely to be contemporary; and it seems probable that this may be the earliest shrine, and that the northern portion was an entirely new construction, of one date, when the increasing fame and wealth of the temple, and the numerous pilgrimages made to it, rendered an enlargement desirable at least, if not necessary. It seems, however, certain that this earlier portion was not neglected on the completion of the other, for in both alike we find traces of extensive repair in Roman times.

Professer Dyer, of Harvard, who visited the site just as the excavations were complete, and who has taken a deep interest in Cyprus, and particularly in this temple, has suggested to me since that this may have been the tomb of Aphrodite, the existence of which at Paphos Professor Dyer says is mentioned by Clement of Alexandria. This is an interesting suggestion; but I fear the exact purpose or use to which this portion of the temple was put must remain uncertain, from want of sufficient data.

Let us now consider the larger portion to the north. Its present outline is a very queer one; none of its main lines seem to bear any relation to the other portion, and it is complicated by the fact that, whereas the enclosing-wall of the earlier works seems to have formed an irregular rhomboid, the Romans in their extensive repairs and alterations have made the parts they dealt with rectangular and parallel to one another wherever possible. Let us, in the first place, confine our attention to the pre-Roman work. The main scheme originally seems to have consisted of a large open court in

the centre, round which, on three sides—the north, east, and south—were grouped various buildings. We have no clue to the treatment of the west side: no traces of any west wall, or of any building further to the west, were found in the portions we were able to excavate; but a good deal of this part we could not uncover, owing to legal difficulties in obtaining digging rights over the land, which belonged to a minor, who was also an idiot.

The court itself must have contained the altar, which, though in the open air, was, we are told by Tacitus, never wet with rain, and probably the sacred cone also stood here; but the court was altered by the Romans, and a large portion of it is occupied by a quarry, so that no detail of its internal arrangement remains. On the north side it was bounded by a stoa, a portion of which still remains; but the east end of it was rebuilt, and the line of it changed by the Romans.

The east side was occupied by a series of chambers, with a broad entrance near the centre of it. The chambers north of this entrance are very imperfect, and the manner in which they were divided cannot be positively determined. The entrance itself is well preserved; at the outer end it was flanked by two piers, whose bases remain, and the southern wall is in particularly good condition; adjoining this on the south side is a chamber, well preserved up to the floor level, and repaired in one place only by the Romans; and next this is a second chamber, which has been very much altered by the Romans. It seems not improbable that a third similar chamber may have existed—at least, there is room for one between the east and the few fragments of the south block of buildings which remain. The two chambers had originally between them and the court a passage or portico, which ceased to exist in Roman times.

The south block of buildings, it is not unreasonable to assume, may have been similar to the north block, and we have fragments at the east end of a small chamber, with a base for a central pillar; but of the rest, only one or two isolated blocks. Some such general plan as this must in all probability have existed before the Romans came upon the scene.

Much of the Roman work, no doubt, dates from the great restoration carried out, in the time of Augustus, after a severe earthquake had greatly shattered the temple, and to this period the south stoa, the central hall, and repairs to the chambers, appear to belong; while the alterations to the north stoa appear to be due to a different epoch of restoration, and may not improbably have been rendered necessary by the tender mercies of another earthquake. Beyond repairs of existing walls, the chief Roman alterations consisted, it seems, in greatly increasing the size of the south stoa, and in the construction of a large covered hall, or peristyle, in a portion of the court.

The south stoa runs along the whole of the south side of the enclosure, and for some reason is not parallel to any of the earlier work; all four walls are traceable, and an inner wall exists, which seems to have been a dwarf wall, about 2 feet high, forming a raised ambulatory round the central portion. It was faced with fine stucco, and provided with projecting brackets for carrying a stone or wooden seat. Down the centre of the stoa ran a series of Doric columns, and most of the bases for these are still *in situ*,

and in two cases the lower drums also. The lower part of this floor was covered with a good geometrical mosaic [Illustn. viii], with an elaborate fret border, executed in natural marble of beautifully variegated colours, in cubes of about half an inch each way; it was laid on a bed of fine cement $1\frac{1}{4}''$ thick, on a thick bed of concrete formed of sea-beach pebbles. Of the floor of the ambulatory no trace remains, but we have a flight of steps leading up to it at the west end. The central range of columns no doubt helped to carry a roof, and it seems not improbable that a range of smaller columns may have stood on the wall of the ambulatory, thus reducing the span, which without them would be rather great.

It is curious that in this stoa, which shows for the most part such extreme regularity, the west wall should be at a different angle, and belong to the earlier structure; and that the line of the ambulatory should follow this—the correction necessary to secure a rectangular line being only made in the outer border of the mosaic pavement.

Fig. 27.—South Stoa, North-West Angle of Ambulatory Wall and the Triangular Block.

Another curious point is the existence of a triangular block of stone [fig. 27] standing in the centre of the mosaic. It is of a dark green colour, and of very fine grain, the edges all having the appearance of being worn; and it seems to have been in position there before the construction of the stoa itself, the mosaic being carried all round it, while it is imbedded in the concrete bed.

Another important piece of Roman construction was the central hall, occupying part of the great court. Whether anything of the kind previously existed it is impossible to say, for the rock comes at this point so closely to the floor level of the court that any remains of earlier work would necessarily have been removed for its construction. Whether destroyed by earthquake, or intentionally demolished, the portico that formerly existed between the court and the central and south chambers was now done away with, or rather absorbed into this court; for we found evidence that the pavement ran over what was originally the west wall of this portico. A large rectangular drain runs under this court, and out through the east entrance, with a fall in that direction.

The central hall, no doubt, had a roof, with an open colonnade on two sides; and it seems likely that the roof was also returned along the east side of the court. Some remains of a Roman foundation for a wall, which would be in a suitable position for such a purpose, exist; and covered communication would thus be given between the north and south stoa, and also to the chambers further east.

A few walls belonging to small buildings were found grouped round the north stoa, but these were entirely of Roman construction, and appeared to belong to dwelling-houses or priests' residences.

We have now taken a general survey of the remains that exist, describing their different parts. It is difficult to assign to each its proper use with any very great degree of certainty, but it seems tolerably evident that the immense south stoa, which appears to have an entrance-portico projecting from near its centre, must have been the part first entered by the general mass of pilgrims and worshippers. The central hall and court—in which the sacred cone and altar must almost certainly have been situated, though their position cannot be in any way fixed—were no doubt entered by the worshippers from the stoa. The chambers, in part at least, were probably store chambers for the immense treasure possessed by the temple; but one may in all likelihood have been connected with the Oracle which existed in connection with the temple. Others may have accommodated the temple attendants, large numbers of whom were attached to it; and the north stoa may not improbably have been reserved to them. It would, I fear, be unavailing to enter into a more elaborate arrangement of the several parts, the exact uses of which must be largely conjectural.

The character of the work in the southern detached building has been already described; the early (pre-Roman) work in this larger enclosure is all very uniform in character, and consists of a basement of smallish, squared stones; while above the ground level the walls commenced with a course of large, tall stones, but not at all approaching in size the stones of the southern portion, and the surfaces are somewhat roughly finished. Nowhere have we any trace of more than a single course of these large stones, and the upper parts of the walls must either have been of brick, which has perished, or of smallish stones, which have been carried away. Part of this work, at least, is set in a very fine mortar [fig. 28].

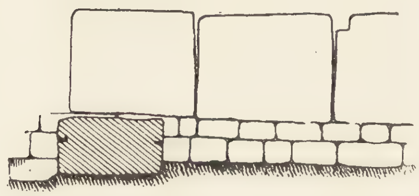


Fig. 28.—The Third pre-Roman Period.
Section D D, see Illustn. vii.
Scale: 8 feet to an inch.

The Roman work usually commences with a foundation of very coarse concrete, with a rough superstructure of re-used stones, inaccurately fitted, and bedded in coarse white mortar up to the floor levels. Above the floor level, in a few cases, we have the commencement of walls treated similarly to the earlier ones—that is to say, commencing with a course of large stones; but here, also, the upper parts are wanting. The work about the north stoa, though in a general way similar, is even rougher and coarser than the rest, and the mosaic floor is also coarser, and made up of larger cubes [fig. 29].

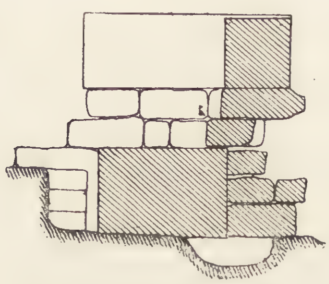


Fig. 29.—Roman Construction.
Section E E, see Illustn. vii.
Scale: 8 feet to an inch.

Besides the plan itself, a certain number of objects of interest were unearthed, but no individual object of supreme interest was found: first, 130 inscriptions, of which four were in Cypriote character, two in Latin, and the rest in Greek, many of them

beautifully cut, and consisting mostly of inscribed bases of bronze statues dedicated to Aphrodite, an immense number of which must have existed in the temple; secondly, a splendid bronze-gilt pin, which, with the marble head of Eros, is now in the British Museum. Several fragments of vases, terra-cottas, statuettes, &c., were also discovered, the whole of which are described in the *Journal of Hellenic Studies.**

In conclusion, I can only say that our work was rendered comparatively light by

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* Vol. ix., No. 2, October 1888, "Contents of the Temple," by E. A. Gardner, pp. 216–224. Mr. Gardner states that "almost all that was found had been buried beneath the Roman mosaic" [Illustn. viii]. An abstract of his description of the several articles thus found is here given:—

1. A set of statuettes of a type common enough on the most primitive sites in Cyprus and elsewhere, and which seem to represent the earliest form of those statuettes, sometimes intended as images of the goddess herself, sometimes of her worshippers, that are found on almost all Cypriote temple sites. The figure is in many cases distinctly female; the face is indicated in the most primitive fashion; usually the features consist merely of excrescences for the nose and ears, and depressions for the mouth and eyes.

2. One small image of stone was found, though hardly of Cypriote style, being devoid of any style whatever.

3. A marble head, of archaic Greek style, about half the scale of life. By the narrow eyes, with strongly marked projecting lids, and by the expression of the mouth, with its corners drawn slightly down rather than up, this head distinctly attaches itself to that series of archaic works best known in its later development by the type known in the "Apollo on the Omphalos" and other kindred works. It does not seem to show any distinct trace of Cypriote influence, and thus proves that early in the fifth century dedications from Greece were offered in the temple. It is now in the University Galleries at Oxford.

4. Marble head of a boy, about three-quarters life-size, of Greek style and careful work, not lacking in originality. The upper ridge of the teeth, showing through the half open mouth, forms a noticeable feature in the expression; and from the place where it was found it may readily be conjectured that this head comes from a statuette of Eros. In the delicate modelling of the surface and the soft and varied play of light and shade are clear indications of an original marble work and not a copy. It seems to resemble the work of the younger Attic school; and on the whole it might not be too rash to call the head, for the present at least, the Eros of Paphos. It is now in the British Museum.

5. The face of a terra-cotta mask, or possibly of a statue, of good Greek style and about life-size; now at Haileybury College.

6. A small hollow bronze Silenus-mask, 1½ inch high, wonderfully careful and delicate in workmanship.

7. Various terra-cotta figurines of common Greek types, of good period.

8. Three fragments of a rhyton of fine red-figured Attic work, of about B.C. 400. The form of the vase appears, from an extant fragment of an arm, to have been like that of a vase in the Branteghem collection, in which the vessel is supported by a crocodile seizing a negro. The drawing is very fine, such details as the bristles of a boar being carefully rendered.

9. A small fragment of a Panathenaic vase, of the fourth century, 5⅛ × 2⅞ inches, of that archaistic class of which several specimens have been found at Capua and other places.

10. A vase with a terra-cotta group on the neck representing a boy and girl in the attitude of the well-known "Cupid and Psyche" groups.

11. A pin, 7 inches long, made of bronze overlaid with a thin gold plate. It ends in a long, sharp point; then follows a plain shaft bearing a dedication in the letters of the Ptolemaic age. The most noteworthy part of the pin is its head, which resembles a very ornate capital of a column.

12. Marble statuette, 12½ inches high, representing a female figure, perhaps Aphrodite, and Eros.

13. Various fragments of marble reliefs and statues. One relief, of the knees and part of the legs of a fully-draped female figure, is of very good work in the style of the Attic reliefs, early fourth century.

14. A relief of Leda and the Swan, but much worn away.

15. Two late Roman statues, in coarse, rough stone; both headless and life-size, representing draped female figures.

16. A curious slab of white marble of the shape of a right-angled triangle, with the other angles of about 60° and 30°. On it was incised, in broad lines, a circle with two parallel marks running out from its circumference at the top and bottom, and also at each side. It might, perhaps, represent a solar symbol.

the fact that the remains lay so near the surface, otherwise it would have been impossible to complete the work in a single season ; but this no doubt contributed to the scarcity of the remains on the site, as it must have rendered the plundering of it an easy matter in the past. Of the objects found, the smaller ones were mostly used as hard, dry rubbish under the Roman mosaic floor, and the inscribed bases had nearly all been pitched into the pit or quarry in the centre of the open court.

R. ELSEY SMITH.

[Notes by Francis C. Penrose, M.A. Cantab., *Past Vice-President.*]

The few observations I have to make are entirely in praise of what Mr. Elsey Smith has brought before the Institute. It is a very great advantage to a lecturer to be able to bring his audience into the immediate presence of the buildings he is describing, and that he has most happily done on this occasion by the realistic photographs which he has exhibited on the screen,* and which prove with what extreme accuracy and care he has taken them, by the fact of their enlargement not showing defects. Upon the greater part of the discourse connected with Cyprus I can offer no observations, except one which is no original remark of mine, but I think it is worth mentioning.

It is possible that this plan which has been shown of the Cypriote temple is, to a certain extent, analogous in its arrangements to that of Solomon's Temple, and therefore it may give some clue to the better understanding of that most interesting structure. On this account alone the examination of the Temple of Aphrodite in Cyprus has not been labour wasted. The finds, indeed, have not been very beautiful architecturally; but still the plan is remarkable, and its use, I think, has yet to be made out. With the Acropolis at Athens I feel more at home, and I can say I derived very great pleasure from and took great interest in Mr. Smith's representations and descriptions. I can vouch for the careful and thorough manner in which he has conducted us from point to point, giving a clear account of what has been recently discovered with as little deviation into debatable matter as the subject admits of. From the description he has given of the Propylæa, and in which he had the great advantage of Dr. Dörpfeld's lecture and notes, I think we are enabled to form a tolerably clear notion of the original design of Mnesicles—that is to say, of the building if it had been completed. I should like, however, to observe that on the less important question of the treatment of the incomplete south wing there seems ground for difference of opinion, and it appears to me that there is sufficient evidence that this wing, when brought prematurely

* The photographs taken in Greece and Cyprus by Mr. R. Elsey Smith were exhibited by the lime-light during the reading of his Paper.

to a termination, did not exhibit such an irregular form as would appear from the description which Mr. Smith, quoting from Dr. Dörpfeld, has given. I certainly agree with Mr. Smith in his regrets that all the mediæval works have been destroyed, and I particularly lament the loss of the picturesque Frankish tower which was pulled down many years ago. It is true that some interesting fragments have been thereby recovered, but most of the information derived from them could be obtained from other sources, or by an examination of the fragments themselves *in situ.* I certainly think that the few inscriptions which have been obtained during these demolitions have been gained at a great price. I do not, however, apply these remarks to the examination of the subsoil of the Acropolis, and especially of the space between the Parthenon and the Cimonian wall, which has been full of interest. The discoveries there have yet to be interpreted, and it would be, I think, quite premature to attempt to explain the total result of the recent excavations.

Mr. Smith has produced evidence showing that the remains of the Dionysiac theatre are of extreme importance and value; as also the neighbouring buildings on the southern slope of the Acropolis.

In his account of that very intricate building, the Temple of Ceres at Eleusis, Mr. Smith has steered, I think, very happily through the maze.

The remains at Epidauros are of extreme interest, and the building called the Tholos, at which that beautiful Corinthian cap [Illustn. iv] was found, must have been a work of surpassing beauty—indeed, so was the theatre. There is another theatre in Greece which has fortunately been untouched by the Romans, and resembles, in many respects—only much smaller—the theatre at Epidauros. I mean Oropos, in the northern corner of Attica, where the shrine of Amphiaraos was founded; and the theatre there contains quite as well-preserved, and in some respects even better preserved remains than those at Epidauros. The remains at Epidauros, including the theatre, had been overgrown with trees, the roots of which made great havoc with the architectural remains; but this theatre at Oropos appears to have been, for the most part, buried in soft earth, which has been washed down from the hill behind it. To me the cap from Epidauros is extremely interesting, because it is very similar to the capitals of the columns of the Temple of Jupiter Olympius* at Athens—a temple to which I have paid mnch attention. The forms of the leaves in the two examples greatly resemble one another, and the ornaments—namely, both the central flower and that figure somewhat resembling a fleur-de-lis which occupies the curve of the volute—have their counterparts on the central flowers of the caps of the Athenian temple, and thoroughly confirm my opinion that the remaining columns of the latter are Greek and not Roman work.

At Mykene, Mr. Smith, in showing the curious section of the hearth plastered with successive layers of plaster, reminded me that in the same building the staircase, which was formed by plastering risers and treads upon a rubble core, had been repaired several times exactly in the same manner.

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* See Mr. Penrose's Paper, *The Temple of Jupiter Olympius*, in TRANSACTIONS, Vol. IV. N.S., p. 91.

I ought to say a few words about the Palace of Tiryns, of which perhaps some may remember my statement that, after a short cursory visit, I had reason to doubt whether the remains were of the great antiquity which had been ascribed to them. The walls are so rough and badly built in many parts of the Palace of Tiryns that I could not believe them to be works of the good Greek period. However, on subsequent examination I saw they were necessarily fitted to portions of the building which bore undoubted traces of the work of the great ancient builders, and the doubts I formerly had respecting the walls fell to the ground, and I quite agree that Dr. Schliemann has found at Tiryns the palace of the ancient kings. I was further confirmed in my matured opinion by the discovery of the palace at Mykene, which bears distinct parallel traces to that at Tiryns, and in which the evidence of high antiquity is incontrovertible.—FRANCIS C. PENROSE.

LXVII.

THE ARCHITECTURE OF PROVENCE.

By Mr. David MacGibbon.

Mr. J. Macvicar Anderson, *Vice-President*, in the Chair.

Mr. Vice-President and Gentlemen,—

THE title of this Paper includes a very wide range of subject, extending over nearly three thousand years. For architecture may be said to have been introduced into Provence by the Phœnicians, by whom the country was colonised about one thousand years before Christ, and traces of whose works are still discernible in the harbours they established and the relics of the worship they observed. To the Phœnicians succeeded the Greeks, who have left enduring evidence of their settlement in the refined taste of the monuments and sculptures of the country. After the Greeks came the Romans, who in the first century of our era established flourishing colonies throughout Gaul, and speedily civilised and Romanised the country. The delightful climate of Southern Gaul made it the favourite province of the empire, and it was endowed with a double portion of the magnificent structures with which the provinces were adorned and amused, while they were drained by their imperial rulers. The remains of some of these splendid works still survive at Arles, Nîmes, Orange, Vienne, and in many of the smaller towns of Provence; but it is remarkable that in the great and populous cities of Roman times, such as Marseilles and Narbonne, scarcely a vestige exists of the great buildings which gave these towns a certain resemblance to Rome herself.

The study of all these relics of antiquity is very interesting and instructive, but it is the study of foreign art in Provence rather than that of the native architecture of Provence itself. I propose to direct your attention to the latter subject, in the belief that it will be to a certain extent novel to some, and possibly not without interest to all.

Provençal architecture sprang up along with the revival of arts and letters throughout Christendom, which may be said to date from about the time of Charle-

magne. The invasions of the barbarians had then been checked, and the West of Europe began to feel a certain amount of rest and security. Up to this time the architecture of Rome everywhere prevailed. The conversion of the Empire to Christianity had produced little or no effect on its architectural style. The features which characterised the architecture of the first three centuries continued to be practised in the succeeding epoch. The same classic columns and entablatures, and the same forms of roofs, vaults, and domes were common to the Pagan temples, basilicas, and tombs, and to the Christian churches and baptisteries. But as time progressed certain changes gradually took place in the Roman style of construction.

The arch, which during the whole course of Roman architecture had been gradually assuming a more prominent position in the designs, began in the Lower Empire to entirely supersede the lintel, and circular archivolts sprang directly from the capitals. This was the form of construction which the barbarians found in use in the Empire, and which was adopted by the Goths of Lombardy and Germany. They retained the simple and natural elements of stone construction in the pillar and arch, while Roman enrichments were gradually dropped.

The mode in which Roman architecture was continued in the West, as late as the ninth century, is well illustrated by the church or mausoleum erected by Charlemagne at Achen, the design of the construction being copied from that of San-Vitale at Ravenna, which again was erected some centuries earlier in imitation of the Temple of Minerva-Medica or some other similar structure in Rome.

San-Lorenzo, at Milan, is another well-known instance of a mediæval church erected in the style of a Roman building, and we shall presently meet with others which show that the influence of Roman art lingered long in the West.

Where Roman examples existed it was natural that the works of the Teutonic invaders should to a certain extent be imitations of them. The wisest of these settlers had not been slow to observe and admire the power and grasp of the institutions and civilisation which they had superseded, and they endeavoured to collect and administer the Roman laws. They would naturally also encourage a revival of Roman architecture, especially in connection with the Church to which they had become attached. In these works the old Roman forms of arched construction were generally adopted, and in districts where Roman models existed the ornament was either copied or the actual sculpture removed to the new buildings. In other districts, where Roman models were scarce, or where the Roman influence was small, the ornament was less Roman in character and partook more largely of the native taste, which found lively expression in scenes of fighting, hunting, or grotesques representing the favourite occupations or fancies of the energetic sons of the North. The styles of architecture which thus arose in Lombardy and the Rhineland, and subsequently in Normandy and England, all classed under the general title of Romanesque, are well known. The beautiful and comparatively classic style of Romanesque in Tuscany is also familiar to us. These different aspects of Romanesque distinctly indicate the presence or absence in various localities of Roman models; though the principle of arcuated construction prevails in all.

Let us now turn to Provence. There the number and splendour of the Roman edifices had been very great; and, notwithstanding the destruction by the barbarians, many survived, and the soil was strewn with sculptured fragments. It is to this favoured province, then, that we should naturally look for a close imitation of Roman forms, both in construction and ornamentation, and I think we shall find our anticipations fully justified. We shall see all the Roman elements preserved and still in daily use till the eleventh century, and we shall note their gradual change in the twelfth century, under the influences of the new conditions of society, into a special form of Romanesque, in which the stages of transition are clearly discernible. The following examples will illustrate these points.

The Church of Saint-Paul-trois-Châteaux.—This elevation might well be taken for a structure of the Lower Empire, but is supposed to be of the tenth or eleventh century. The pilasters and the intermediate arcades crowned with a full entablature of architrave, frieze, and cornice, enriched with Roman ornaments and modillions, might be part of a Roman amphitheatre. These features were doubtless copied from the Roman structures which then existed on the spot. [Illustn. ix.]

Fig. 30.—Aix-en-Provence Cathedral.

The porch of Notre-Dame-des-Doms at Avignon.—This design is so strikingly ancient in character as to have long been regarded as a classic structure of the Lower Empire. We have here engaged and fluted columns with Corinthian caps, sustaining an entablature carved with egg and leaf enrichments, and a subordinate arch springing from pilasters. This is probably a work of the tenth or eleventh century. At Aix-en-Provence portions of a similar porch have been preserved, having engaged Corinthian columns, an enriched cornice, and a central arch. The doorway shafts and the horizontal arch above them are of the twelfth century [fig. 30].

The Sainte-Trinité (one of the early chapels on the Island of Saint-Honorat-de-Lérins).—This is clearly an imitation on a small scale of Roman domical and

vaulted construction [fig. 31]. The work is rudely executed, evidently by unskilful hands. The details bear a close resemblance to those of the cloister of the famous monastery

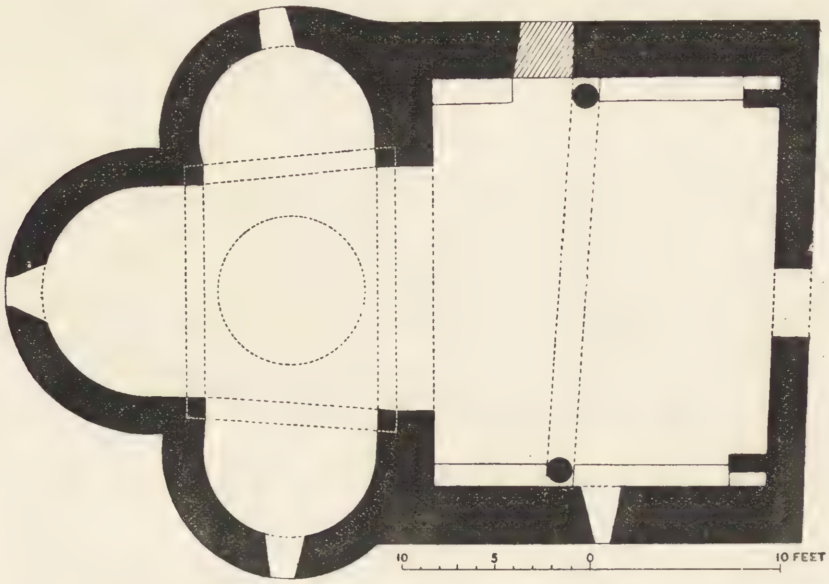

FIG. 31.—CHAPEL OF THE SAINTE-TRINITÉ, SAINT-HONORAT-DE-LÉRINS.

[See Illustn. x.]

FIG. 32.—ENTRANCE TO THE CHAPEL OF THE SAINTE-TRINITÉ.

of Saint-Honorat on the same island, probably erected in the twelfth century; but one cannot refrain from attributing a considerably older date to the Sainte-Trinité. The doorway [fig. 32], like the rest, is rudely built, probably with fragments of a Roman edifice [Illustn. x.].

Baptistery at Fréjus Cathedral.—There is an octagonal baptistery at Fréjus [fig. 33] which we may take as a sample of several similar structures in Provence, long regarded as Roman works. The baptistery stands at the west end of what probably was an atrium, with the church at the east end, as at San-Ambrogio, Milan, and other places. The granite columns in the angles may possibly have been derived from a Roman building; but the moulded blocks on the top of the

caps from which the arches spring would rather recall Byzantine design, in which a somewhat similar block (supposed to be a reminiscence of the entablature) is generally superimposed on the capital.*

The Monastery of Montmajour.—This celebrated monastery, situated near Arles, contains several buildings of great interest in connection with the development of Provençal architecture. Of these the chapel of Sainte-Croix is remarkable. The plan, with its four apses arranged in the form of a quatrefoil, and surmounted by a square dome, and the large porch, recall that of Sainte-Trinité, but the work is much superior. The modillions and ornaments are Roman. It is a late example of an imitation of a Roman form of construction. Churches of a plan similar to the

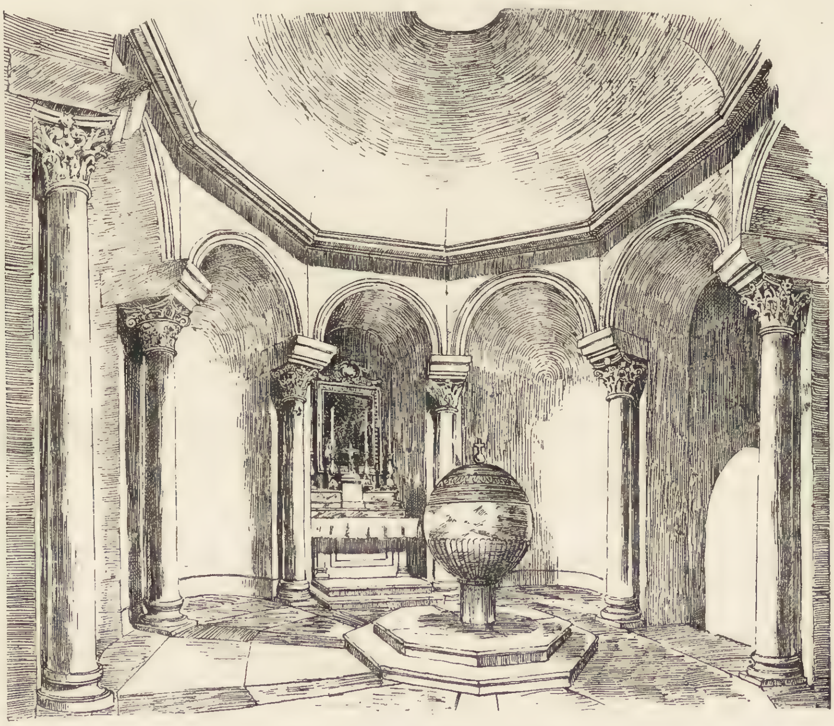

FIG. 33.—THE BAPTISTERY AT FRÉJUS CATHEDRAL. [See p. 77.]

above are frequently met with in Spain. They are well illustrated in the late Mr. Street's admirable work on the architecture of that country; and one at Gerona may be mentioned as an example.

Chapel of Saint-Pierre, Montmajour.—At the base of the rock on which the monastery stands is the Chapel of Saint-Pierre, a remarkable example of early deviation from the traditional type of classic columns and capitals—a deviation which afterwards became common, through the growth and influence of the Gothic or Teutonic spirit.

* In the front of Saint-Gabriel, near Arles, we have an example of a more advanced stage. The doorway with its pediment and classic enrichments is here connected with an arched entrance of a decidedly Romanesque character.—D. M.

That spirit was making itself felt both north and south of the Alps, and could not fail to find a response amongst the Visigothic element in Provence. Accordingly we find a gradual transition going on in the twelfth century, from the purely Roman types to others more akin to the Romanesque of Lombardy and the north [figs. 34, 35].

Saint-Trophime, Arles.*—We have two very fine examples of the fully developed Provençal Romanesque in the western portal and cloisters of Saint-Trophime. The former still retains some Roman features in the podium on which stand the columns bearing an entablature. The latter, though greatly modified from the earlier examples, still retains the elements of architrave, sculptured frieze, and cornice. The enrichments also are classic. The niches filled with statues, and the other sculptures with which the façade is covered, are evidently derived from the Roman models, in which this district richly abounded. The advance of the Gothic spirit is visible in the preponderance of the arch over the entablature, in the encroachment of the sculpture on the cornice, and in the numerous grotesques with which the corbels and

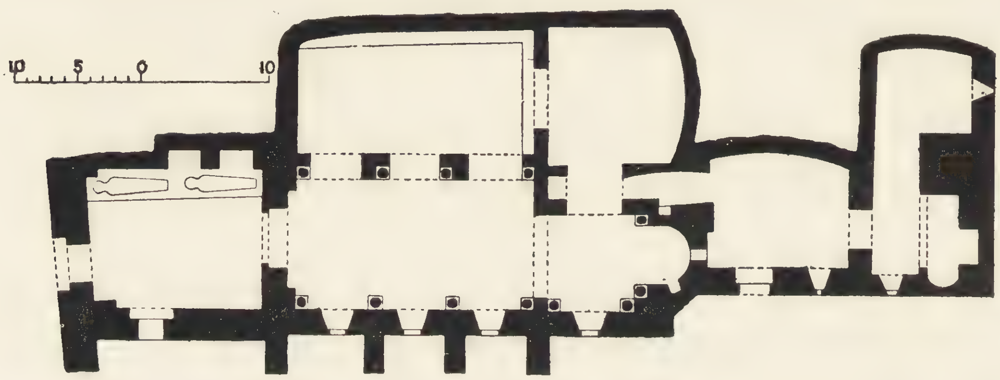

Fig. 34.—Chapel of Saint-Pierre, Montmajour.

bases are covered. The tower also shows its classic derivation in the pilasters and cornice with which it is ornamented. Another portal of similar design, but rather more Romanesque in character, is found in the church of Sainte-Marthe.

The Cloister at Arles.—In this example the same feeling is carried further, as shown by the thin proportions of the coupled shafts, the large caps carved with grotesques or sacred history, the arches springing directly from the abacus of the twin caps. But the classic elements still linger in the fluted pilasters and large statues of the piers. This style of Romanesque is very abundant in the South of France, and is particularly well preserved in the cloisters, where the ornament is generally more abundant than in the churches.

The Cloister at Elne.—This is one of the finest examples. In it the Visigothic spirit prevails completely over the classic, which is here quite unobservable.

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* See Mr. A. Needham Wilson's *Notes of a Tour in Provence and Languedoc,* in Transactions, Vol. IV. N.S pp. 133–140, with an illustration (xxii) of the west portal.

The portal of the Church of Saint-Gilles at Tarascon.—The most finished illustration of this Provençal style is the portal of Saint-Gilles, near Arles. It resembles that of Saint-Trophime, in its classic columns, crowned with relics of an enriched entablature, and in the fine statues in niches separated by fluted pilasters and standing on an enriched surbase; but at the same time the Gothic spirit is evinced in the grotesques of the corbels and bases, in the sculptured friezes, which almost swallow up the architraves and cornices, and in the predominance of the three great arches of the doorways. This

Fig. 35.—Chapel of Saint-Pierre, Montmajour.

edifice was commenced in the eleventh century, but it, as well as other works in the South of France, was interrupted by the Albigensian crusades. We may therefore regard this phase of Provençal architecture as terminating about the middle of the twelfth century, at which date this last style representative of Roman art ceased to exist, and was superseded by another very different form of architecture.

French writers are fond of maintaining that much of Provençal art is Byzantine, but it does not seem to be necessary to go so far from home to trace its origin. We

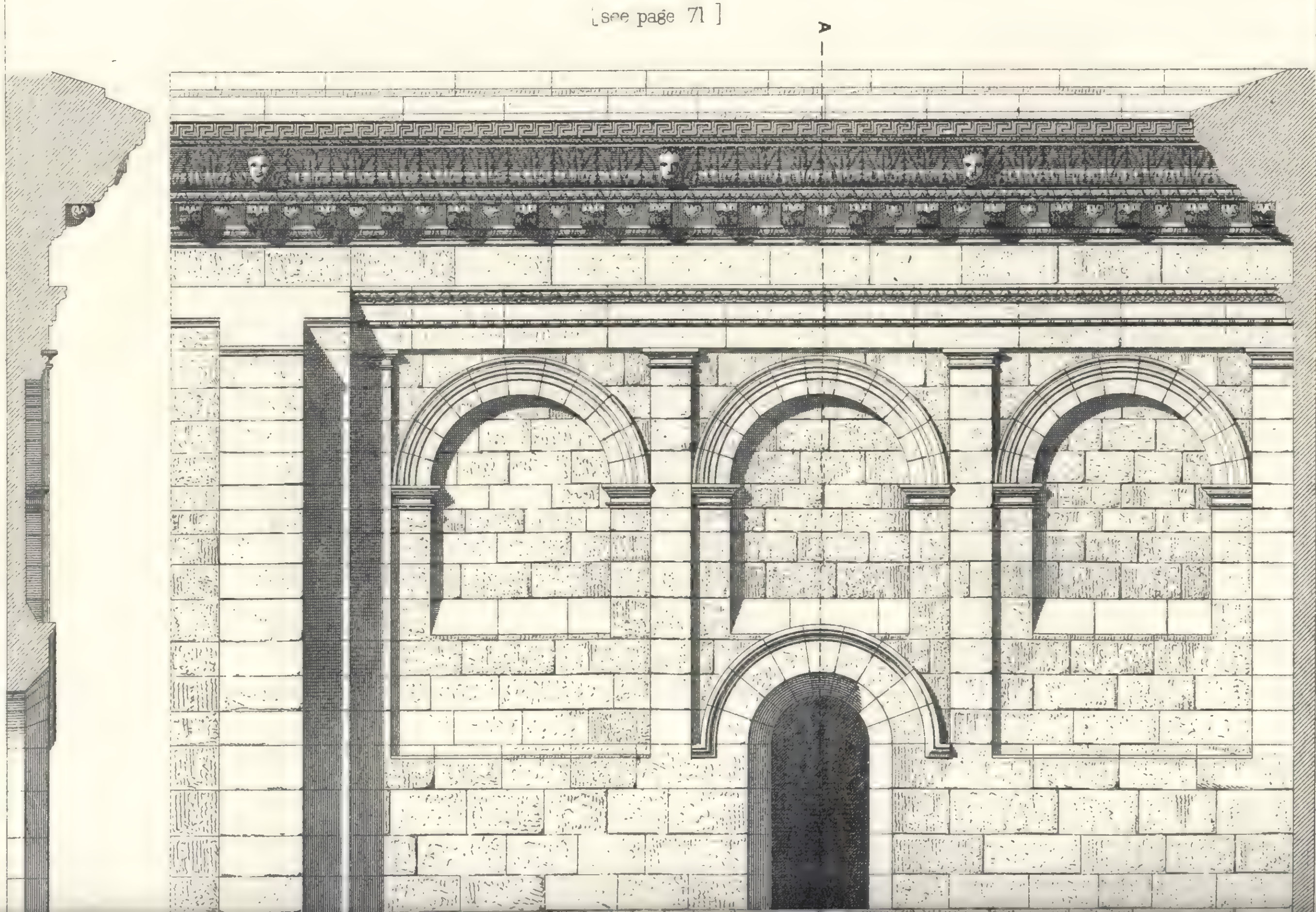
have seen that the classic features are all allied to the Roman structures on the soil, and the figure sculpture which forms one of its leading elements is undoubtedly Roman in origin, and could not possibly be derived from the iconoclastic East. That the intercourse with the Levant produced some effects in Provence may readily be conceived; but, so far as the edifices we have been considering are concerned, those effects were small, being probably limited to the ornaments on the sculptured figures and similar minute work, which might be copied from the artistic carvings on the wooden or ivory cases, or the fine designs of the metal articles brought from the East.

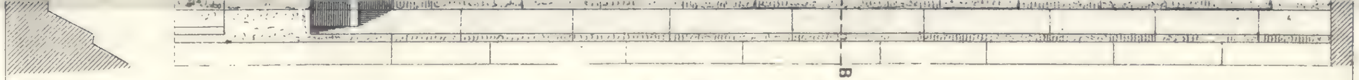
I have hitherto said little regarding the vaulting of the Provençal buildings, as that forms a subject quite apart from the Romanesque nature of the style. Many of the early Christian edifices, especially baptisteries, were vaulted, after the manner of Roman tombs. The apses were also invariably vaulted, but the basilican or three-aisled churches seem to have been usually roofed with timber. In course of time, however, it was found desirable, for security, to cover these churches with vaults, and this was carried out in Provence in a way similar to what was adopted on the Rhine and elsewhere—viz., with a waggon-vault over the central aisle, buttressed by half-vaults over the side aisles. But in Provence the vaults had this peculiarity, that they were pointed and not round-arched as they were everywhere else. Whence the idea of the pointed arch was derived it is difficult to say. Possibly it may have been borrowed from the neighbouring Moors in Spain, by whom the pointed form was used ornamentally. Or it may simply have arisen from the requirements of the case, the pointed arch being the form which was found best adapted to meet the various wants of the time. This it did in several ways, especially by facilitating the unskilful attempts at vaulting at that period. Thus firstly, it was easily constructed, as compared with the round arch; secondly, it exerted less thrust on the side walls; and, thirdly, it was the best form for receiving the roof tiles, which were laid directly on the extrados of the vault.

Whatever its origin, the Provençals had the merit of introducing the use of the pointed barrel-vault over the central aisle, supported by semi- or three-quarter-pointed vaults over the side aisles. These vaults were usually strengthened with transverse ribs over the main piers of the nave. Mr. Street has pointed out that similar forms of vaulting were common in Spain, and he is of opinion that they were imported from Provence. The origin of this kind of vaulting seems to be undoubtedly Roman. The Temple of the Nymphs at Nîmes still retains similar transverse ribs, supporting the filling-in of the plain vault, which consists of stone flags laid between the ribs. In Aquitaine and the west of France another form of Roman vaulting was retained—viz., the dome. We are all acquainted with the story which assigns the introduction of the dome into the south and west of France to the Venetian merchants, who are thus supposed to have impressed at second-hand a Byzantine influence on that locality. It seems, however, scarcely credible that the domical vaulting, so common over the whole of those provinces, should be entirely due to the importation of one foreign example, which, after all, is a very imperfect reproduction of the

LXVII. THE ARCHITECTURE OF PROVENCE (ix)

[see page 71]

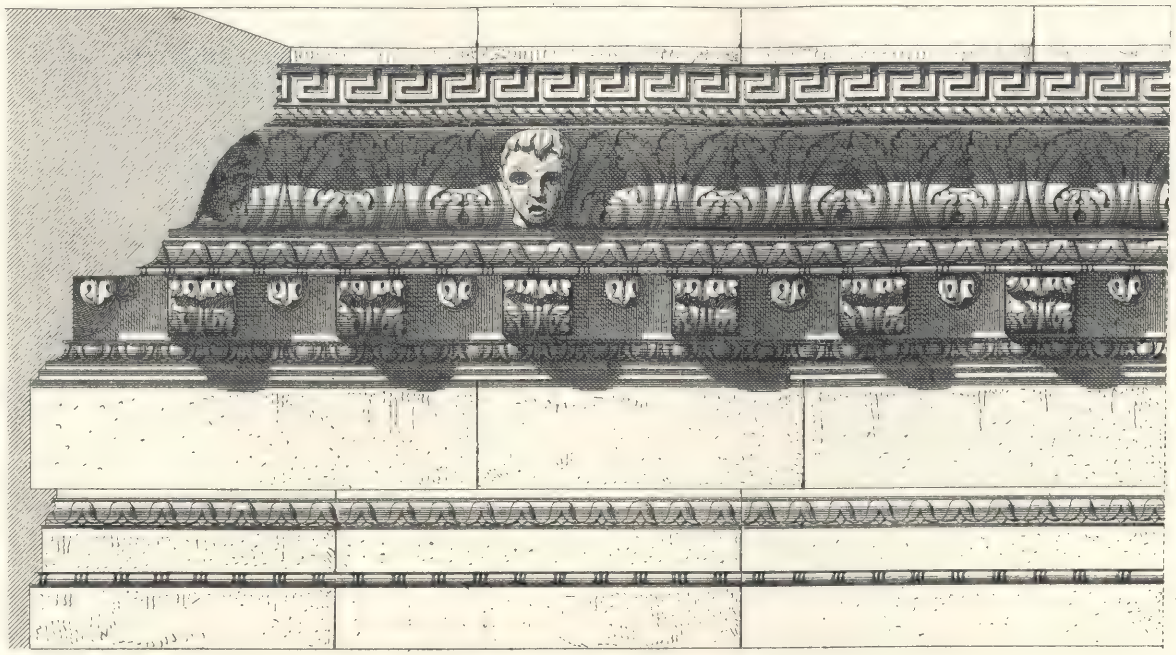




SECTION A.B.

ELEVATION OF AN EXTERNAL BAY OF THE NAVE.

Scale of 1 0 1 2 3 4 5 6 7 8 9 10 11 12 *Feet*



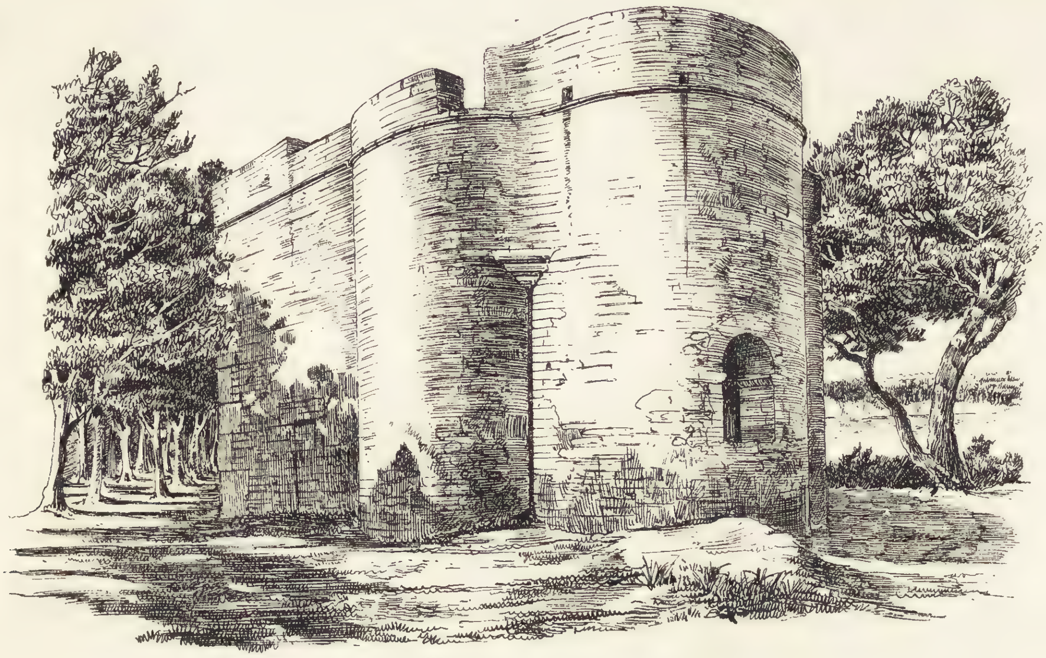
DETAILS OF THE ENTABLATURE.

H. Revoil del. J. Penel Sc.

THE CHURCH OF SAINT-PAUL-TROIS-CHÂTEAUX.

[EXTRACTED FROM "L'ARCHITECTURE ROMANE DU MIDI DE LA FRANCE", VOL. III. PL. XXXII.]

C. F. KELL PHOTO-LITHO 8. FURNIVAL S^T HOLBORN. E. C.



CHAPEL OF THE SAINTE-TRINITÉ, SAINT-HONORAT-DE-LÉRINS.
SOUTH EAST VIEW.

SOUTH WEST VIEW.

From drawings by David Mac Gibbon.

[see page 72, Figs. 31, 32, and page 84]

A. Needham Wilson, del.

C F KELL, PHOTO-LITHO, 8, FURNIVAL ST HOLBORN, E.C.

From a drawing by David MacGibbon. *A. Needham Wilson del.*

THE CLOISTER AT FRÉJUS CATHEDRAL.

[See pages 77, 89.]

LXVII. THE ARCHITECTURE OF PROVENCE (xii).

From a drawing by David MacGibbon. *A. Needham Wilson del.*

THE CATHEDRAL TOWER AND BISHOP'S PALACE AT FRÉJUS.

[See page 77.]

From a drawing by David MacGibbon.

INTERIOR OF F

[See pa

A. Needham Wilson del.

ÉJUS CATHEDRAL.

77, 78, 80.]

original. The *plan* of Saint-Front at Perigueux is probably copied from Saint-Mark's, but the method of construction is entirely different, and appears rather to have been that in general use in the country. The system of domical construction is universal in Aquitaine, and seems most likely to have been derived from Roman tradition. It is noticeable that the *plan* of Saint-Front (the portion chiefly imitated from Saint-Mark's) is not repeated in other buildings. Nor can the use of the dome in the complete and independent style of Auvergne be well attributed to the influence of Saint-Front. Moreover, in the churches of almost every country—in those of Lombardy, Germany, Provence, and Spain—the use of the dome in the central cupola was nearly universal. It seems, therefore, likely that each locality adopted certain forms derived traditionally from Roman structures then existing, but which afterwards disappeared.

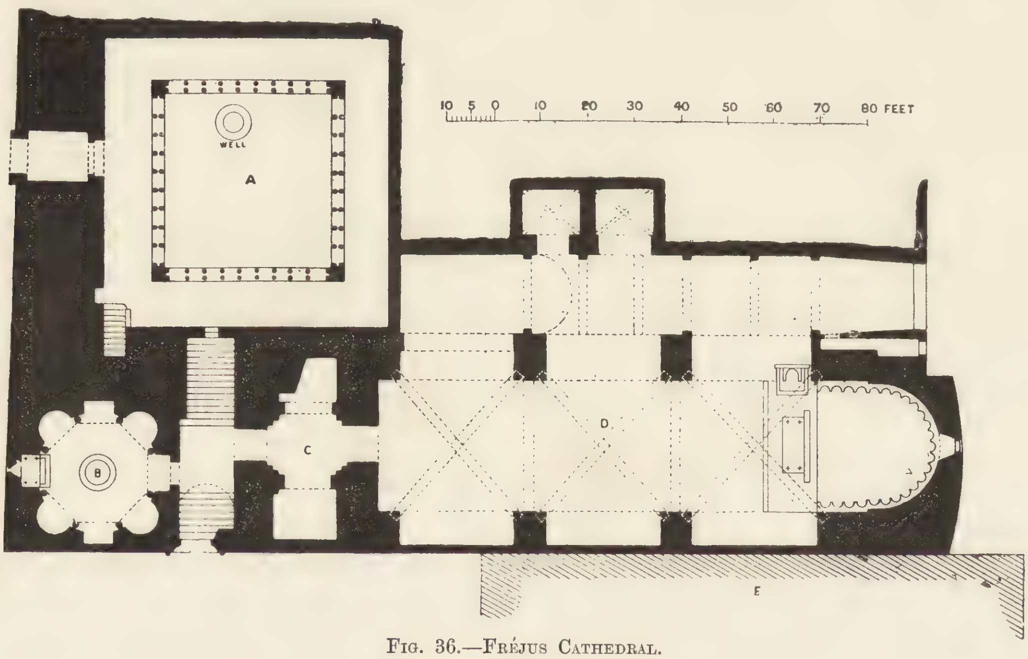


Fig. 36.—Fréjus Cathedral.
A, Cloister; B, Baptistery; C, Tower; D, Church; E, Bishop's Palace.

However, whether arising from the reproduction of Saint-Mark's in Saint-Front at Périgueux or not, there is no doubt that the dome was much used in the south and centre of France. But in Provence its use was limited, as in Lombardy and Germany, to the central cross, or similar important positions. The employment of the dome had some important effects on the structures subsequently erected in the whole of the South of France. Thus the use of the dome with the internal piers or buttresses on which it was carried rendered the abutment by the arches of the side aisles unnecessary. Hence the side aisles are frequently omitted and the church consists of a single nave or hall, with internal piers along the side walls. This single hall was in early examples vaulted with a series of domes, but in other and later examples, and in different localities, the groined vault is frequently substituted for the

dome. The single-hall plan, however, in whatever way it may be vaulted, continues through all the mediæval styles to be a characteristic although not a universal feature of Southern architecture both in Provence and Aquitaine. Another feature in connection with the single-hall plan is that the internal piers or buttresses are employed to inclose a series of chapels along each side of the church. These are necessarily high and out of proportion to their width and depth, as we shall see when we come to treat of the later styles of Provence. The Cathedral of Fréjus was originally an instance within our bounds of the single-hall plan [Illustn. xiii], with internal piers supporting a groined vault with massive crossed ribs. Saint-Paul-du-Var is another church of similar construction.

The examples of Provençal architecture which we have examined give an idea of the various steps by which the Romanesque style advanced in the country up to the middle of the twelfth century. They show that a style was produced which at first borrowed its forms both of construction and ornament from Roman models, and that these were gradually modified by the Northern spirit, and continued to the last to rejoice, like all the other forms of Romanesque, in exuberance of decoration. This style constituted the *first* phase or period of Provençal architecture.

During the latter part of its career a new influence was arising which promised to have a remarkable effect on the architecture of the South of Europe. Hitherto it had been considered laudable to adorn the Christian temple with ornaments and sculptures, but in the twelfth century the ascetics of Burgundy gained a preponderance; and under the auspices of the lately founded Abbey of Citeaux a new and severe system was promulgated. Like the Reformers of later times, these ascetics could see nothing but superfluity and vanity in ornament of any kind, and it was one of their regulations that their churches and other buildings should be entirely free from all adornment and decoration. The Cistercian system spread with amazing rapidity, and many churches and monasteries were erected in the perfectly plain and unadorned style prescribed. The three monasteries of Sénanque, Silvacane, and Thoronet, called "the three Provençal "daughters of Citeaux," are amongst the most striking examples of the style which now arose in Provence, and which I think may be regarded as the second phase or period of Provençal architecture. The three sisters closely resemble each other in style, and to examine one will explain all. Let us therefore look at Thoronet.

The Abbey of Thoronet.—Nothing could be plainer than the exterior—even the entrance doorway has not a splay or moulding round it. The interior is almost equally devoid of ornament [Illustn. xiv]. A well-known peculiarity of plan in the Cistercian churches may be here observed, namely, that the eastern termination consists of a series of apses, projecting to the east from the transept—the central apse projecting farthest, but not sufficiently to be regarded as a choir. The principle of construction adopted is the same as that which prevailed in the earlier Provençal churches, namely, a central nave roofed with a pointed barrel-vault strengthened with a transverse rib over each pier, and abutted by half-pointed vaults which cover the side aisles. In the example before us we have the bare skeleton of the mechanical elements employed in

LXVII. THE ARCHITECTURE OF PROVENCE (xiv).

From a drawing by David MacGibbon. *A. Needham Wilson del.*

THE ABBEY OF THORONET: THE CHURCH.

[See page 78.]

the design of the earlier Provençal churches, but they are distributed in good proportions, and each section is arranged with a simplicity of parts and a directness of purpose which cannot fail to impress the observer. It is like the leafless tree of winter—

> Trunk and bough,
> Native strength.

A greater contrast could scarcely exist than that between this bare but energetic design of the Abbey of Thoronet and the rich and sumptuous style we have previously been considering—a contrast as great as existed between the abstemious but vigorous enthusiasts who occupied its cloister and the princely and luxurious Benedictines whom they desired to supersede.

The cloister of Thoronet is of very simple and expressive character. The caps of the arcade are the only features which may be said to contain ornament, and even there it is very sparingly used. Many examples of this second Provençal style might be cited. The nave of Saint-Trophime at Arles is clearly in this style, and presents a very marked contrast with the rich and elaborate work of the earlier portal and cloisters. The nave has evidently been rebuilt. Its original height is marked by the arches of the central tower, which still remain at a much lower level than that to which the newer nave has been raised. We have thus at Saint-Trophime fine examples of both of the Provençal styles, the first or Romanesque style being represented by the cloister, tower, and porch, and the second or later Provençal style being exemplified in the lofty and simple nave. Small churches and chapels in this style are numerous throughout the country, those at Cannes, Vallauris, and Saint-Césaire being good examples.

It will be observed that this second style is of a totally different order from that of the early Provençal architecture. Here are no Roman traditions; the forms used, though rude, are new and original. Altogether this novel and vigorous style strikes one as having come into existence for the express purpose of stripping off the traditional elements from Provençal architecture, and bringing prominently into view the valuable principles of construction which are its chief merit, so as thus to prepare it for a new and vigorous departure.

While the first revival of Provençal architecture was stimulated and aided by the abundance of classic remains by which it was surrounded, it had also been to some extent trammelled and retarded by them. But the second style, having shaken off all classic traditions, was ready to commence an independent development. What this second Provençal style might have attained to on its native soil, we can, however, never know, as it was speedily encroached on, and finally driven from the field, by the Northern Gothic, which in the thirteenth and fourteenth centuries spread over the whole country, producing a mixture of Provençal elements of construction and Gothic ornamental details which is far from satisfactory. Of this we have an example in Saint-Victor at Marseilles, where the pointed barrel-vault is Provençal in construction, but all the enrichments are in the Northern Gothic style. Sainte-Nazaire at Béziers

shows similar elements in a more fully developed state. This interior also shows the "single-hall" arrangement before alluded to, roofed with Gothic groined vaulting. Saint-Jean at Perpignan is likewise built on that plan, and shows very distinctly the internal buttresses, which support the groined vault of the single wide nave, with chapels between the buttresses. Examples of this style are also numerous in the north of Spain, so well illustrated in the late Mr. Street's fine work on the Gothic architecture of that country (as at Gerona and Barcelona). There also the early simple Cistercian style, with its plain barrel-vaults, is gradually converted into Northern Gothic (see examples at Lugo, Santiago, Segovia). Indeed, this second Provençal style, as modified by Northern Gothic, seems to have received a fuller and more cordial treatment in Spain than in the land of its birth.

Churches in this mixed style continued to prevail in Southern France till the fifteenth century, but the importation of the Northern Gothic became more and more marked as time progressed. In several notable examples the designs are entirely Gothic, such as Saint-Just at Narbonne, the choir of Carcassonne, Saint-Maximin, &c. These are imported designs and strike one as foreign to the soil, and as having no real connection with the native art of Provence. The exterior of the Church of Saint-Victor at Marseilles shows one of the remarkable peculiarities of Provençal edifices. Owing to the frequency of the religious and other wars of the country, it was necessary to construct every church as a fortress, having its towers crowned with frowning battlements and machicolations. The eastern apse of Fréjus Cathedral [Illustn. xiii] was inclosed in a nearly square tower, finished on top with a boldly corbelled parapet, and thus formed part of the fortified enceinte of the cathedral precincts. At Narbonne the cathedral (a purely Northern Gothic design) had nevertheless a high gallery for defence, raised above the chapels of the eastern apse, so as to complete the circuit of the fortifications. At Béziers Cathedral also ornamental machicolations and parapets crown the walls and towers; indeed, almost every church presents externally most of the defensive features of a castle. In the cloister of Fréjus [Illustn. xi] we have a fine example of the Italian Gothic imported into Provence by the Genoese.

There is a very important phase of the architecture of Provence without some reference to which our survey would be incomplete, viz. the military structures of the country. Our time will, however, only permit of a very cursory glance at them.

The walls of the cities of Carcassonne and Aigues-Mortes are deservedly celebrated as the most perfect existing representatives of the art of defence of such places as practised in the thirteenth century. Carcassonne boasts that it was a Roman city, and still retains some Roman works. Probably some of the towers which are round towards the exterior and square to the interior, and are partly constructed after the Roman manner with courses of tiles, are reconstructions, with Roman materials, by the Visigoths, who succeeded the Romans and preserved much of their civilisation.

Carcassonne.—The later (thirteenth century) towers and double walls of Carcassonne show the system of battlements in use at the time, consisting of wooden hoardings projected out from the top of the walls. The holes for the putlogs and corbels for the

wooden struts are very distinctly visible. The great towers of the castle and the Porte-Narbonnaise dominate the whole.

Aigues-Mortes.—The towers and gateways of Aigues-Mortes are no less interesting, and exhibit features similar to those of Carcassonne. Several of the towers here are of the square orm fcommon in the South, with doorways passing through them, without the strengthening round towers usual in the North. The very long loopholes in the walls, which would admit of several tiers of defenders, are common to Carcassonne and Aigues-Mortes. The Tour-Blanche, or citadel of Aigues-Mortes, a great detached round tower at the north-west angle of the fortifications, is a characteristic structure of the thirteenth century.

Avignon.—The city walls of Avignon are also in a remarkably good state of preservation, and show the advance made in this class of works in the fourteenth century. The wooden hoards of the thirteenth century being liable to destruction by fire, there was substituted for them a parapet of stone projected from the face of the wall, and supported on bold stone corbels, with machicolations or apertures for defence between them. The towers are here, as at Aigues-Mortes, square on plan, and the gateways pass through them. Instead of round flanking towers, they were defended by exterior barbicans and drawbridges.

The form of the machicolations of the Pope's Palace is peculiar, consisting of long arched apertures carried on projecting piers. These would admit of longer and heavier missiles being discharged on assailants than the ordinary machicolations between the corbels.

The Abbey of Cruas.—A remarkable and picturesque example of similar defences occurs at the Abbey of Cruas, where the early church has been raised and converted into a fortress.

Villeneuve-lez-Avignon.—The great Castle of Saint-André, on the west side of the Rhone, opposite Avignon, presents many interesting features. Its large gateway shows the Northern style of defence, with the great flanking towers above referred to. The Castles of Tarascon and Beaucaire, the Keep of Montmajour, the Castellet at Perpignan, and others, might also be referred to, and show many striking peculiarities.

There still remains one curious series of structures, which, so far as I know, are peculiar to the district, and to which I should like in a very few words to direct attention. These consist of a series of watch-towers, which occur in all the towns near the Mediterranean. Constant apprehension of attack from corsairs rendered it necessary to keep a continuous watch over the sea. For this purpose tall towers were erected on the highest point of the site of each town, and these towers were so constructed as also to serve as keeps or strong places of refuge in case of danger. It is interesting to observe that they are constructed on precisely the same principle as our Norman keeps and the Scottish castles. The ground floor is vaulted, and has no apertures except narrow loops to the exterior, and is entered by a trap in the vault. The entrance door is on the first floor level, and was approached by a ladder. Generally the upper floors are reached by a stone staircase, which is corbelled out from and winds round the

interior of the walls. The top formed a platform for the watchmen, and was protected with a corbelled and embattled parapet as, for example, the "Tour-du-Chevalier" at Cannes. All the towns of the Riviera are provided with towers or keeps of this description. At Antibes, there are two such keeps, one attached to the cathedral, and doubtless used by the ecclesiastics as a place of refuge for themselves and their valuables, in case of danger. The other was evidently the strength of the podestà or military ruler of the town.

Saint-Paul-du-Var.—In the quaint and interesting town of Saint Paul-du-Var the keep is of a peculiar construction. It is built in the usual style, with a door on the first floor. But from this level there is no internal communication with the upper floors. The second floor was reached by an outside stair which was projected from one face of the tower. By this stair the second floor level was gained through a trap-door in the floor of an overhanging wooden gallery, the corbels for supporting which still remain, while above the outside doorway on the second floor may be seen the water-table and string-course of the gallery. This gallery thus formed a bretèche both for the defence of the staircase and the two entrance doorways on the first and second floors, as well as the base of the keep (similar to some of the Scottish castles). Most of these keep-towers in the towns of the Riviera have unfortunately been much altered and destroyed, but their massive walls still exist.

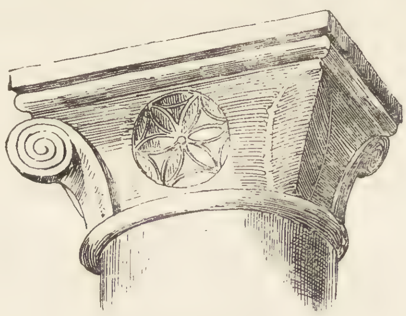
I think we have now touched lightly on the more salient points in the architecture of Provence. We have noticed how the early Provençal Romanesque, which up to the eleventh century was a close imitation of Roman structures, developed in the twelfth century into a richly ornamented one, corresponding with the Teutonic styles of that period in other parts of Western Europe. We have seen how this style was interrupted by the Albigensian wars, and how under the Cistercians a new and perfectly plain but vigorous style was introduced, how its simplicity was gradually encroached on by the more ornamental style of Northern France, and how a mixed and unsatisfactory style was thus produced, whose fate it evidently was to succumb to the perfected Gothic of the North, and to the French influence in the country in the fourteenth century on the one hand, and to that of Italy and the Genoese on the other. We have likewise observed that amongst the Roman features imitated in Provence two of the Roman forms of vaulting were preserved, namely, the dome and the barrel-vault strengthened with transverse ribs—the pointed form being, however, adopted in preference to the round. We have also glanced at the noble military architecture of the South of France, and noted one peculiar feature of it, in the picturesque watch-towers of the towns.

I have only to ask you in conclusion to examine one other very interesting structure, in which are combined examples of all the styles of Provence. This is the monastery of Saint-Honorat [Illustns. xv–xviii], on the island of the same name, off the coast opposite Cannes.

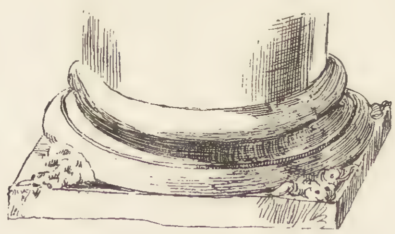
The Castellated Monastery of Saint-Honorat-de-Lérins.—This establishment, founded by Saint-Honorat in the fifteenth century, became one of the largest and most

frequented seats of learning and religion. It was, unfortunately, too much exposed to attack, and formed too tempting a prize to the pirates of the Mediterranean, to escape being frequently pillaged and destroyed. Consequently little, if anything, remains of the ancient monastery. But the damage sustained induced the monks to raise, on a rock projecting into the sea to the south, a strong fortress which should be castle and monastery in one. The exterior presents the appearance of a castle of the fourteenth or fifteenth century, with its rough, natural-faced, and bossy masonry, and its boldly corbelled parapet. The entrance doorway is small, and is placed at some height above the ground. It leads to a small passage with steps at right angles, defended by another door which conducts to the interior. Here, to our surprise, instead of the usual hall of a castle, we find the arcaded cloister of a monastery.

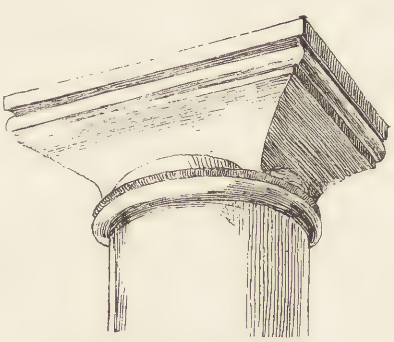
The cloister [Illustns. xv–xviii] of Saint-Honorat has been three storeys in height, but only two of these arcades now remain. That of the lower tier is of peculiar interest. The columns are partly of ancient Roman workmanship, and they have been added to and supplemented by more recent limestone construction. One of the old Roman pillars contains a much-worn inscription to Constantine. The caps and bases show indications of late Gothic design, but the former are of extraordinary forms which at first sight are most puzzling as to their origin and connection. It was not until I had seen the caps of the cloister at Thoronet that I could satisfy myself on



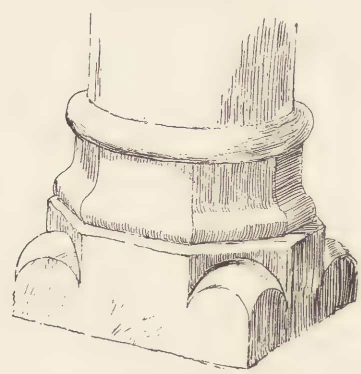
South-East Cap.



South-East Base.



Cap of North-East Column.



Base of North-East Column.

Fig. 37.—Caps and Bases in the Cloister of Saint-Honorat-de-Lérins.

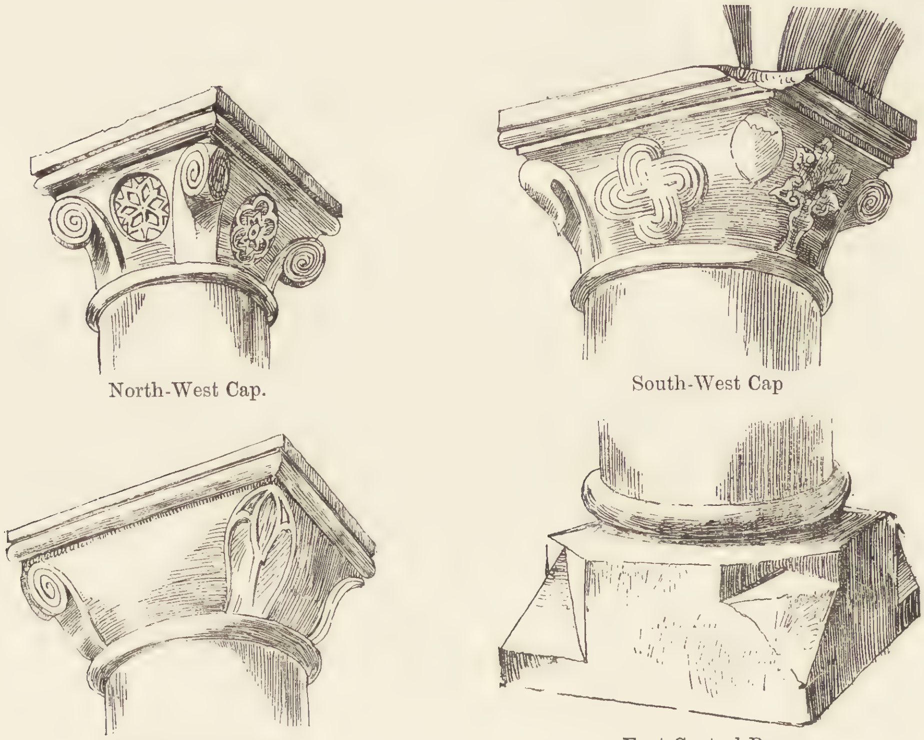


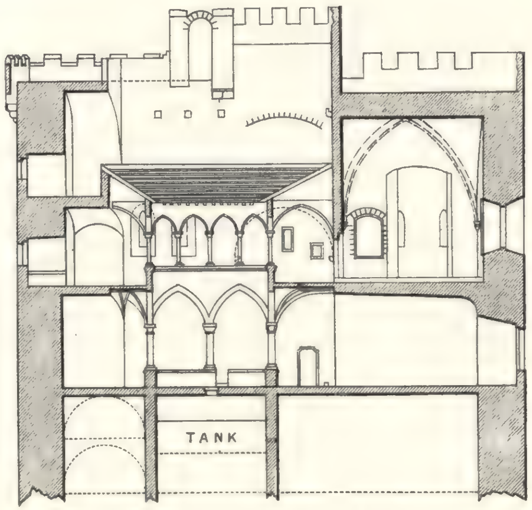
Fig. 37.—Caps and Base in the Cloister of Saint-Honorat-de-Lérins

that point. But when considered in relation to Thoronet the mystery is solved. Some of the caps are distinctly of the same original school of the twelfth century as those of Thoronet, while others have been executed in the fifteenth century in imitation of them, the whole arcade having been reconstructed (after a sack which took place in 1400), with bases and vaulting executed in the style of the period. The upper arcade is of a totally different style, and is a good example of the Italian Gothic introduced into the country by the Genoese. It was probably erected in its present form by one of the Grimaldi who were Abbots-commendatory in the fifteenth century; but it appears to be a restoration of an older structure in the same style. In the sixteenth century the Spaniards got possession of the island, and have left indications of their presence in the alterations they made on the entrance, and by changing some of the chapels into forts armed with guns.

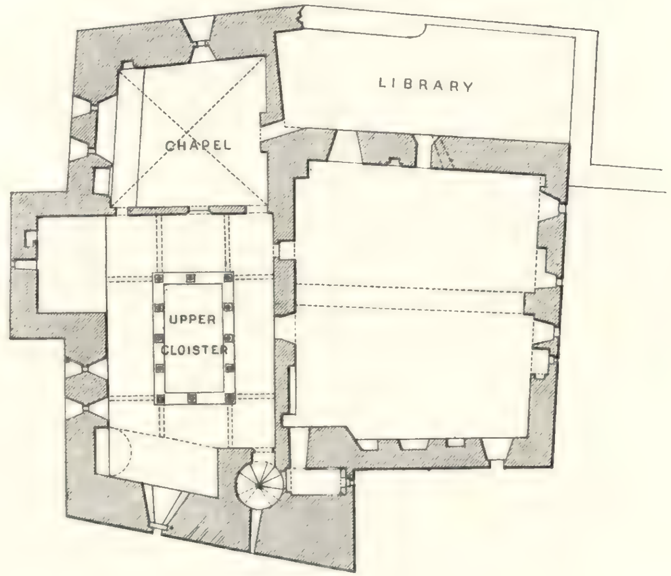
We have thus on the little island of Saint-Honorat, and especially in the castle, ample evidence of its varied fortune and of the different people by whom it has been possessed. Its occupation by the Romans is proved by the massive door of the Chapel of Sainte-Trinité [figs. 31, 32; also Illustn. x] and by the columns of the castle. The period of Saint-Honorat and his early disciples may be traced in the vaults of the Chapels of Sainte-Trinité and Saint-Sauveur. In the castle cloister we find examples

LXVII. THE ARCHITECTURE OF PROVENCE. (xv.)

SECTION.

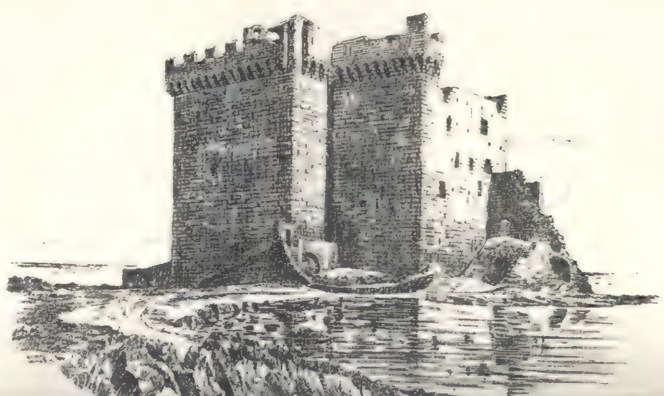


PLAN OF FIRST FLOOR.

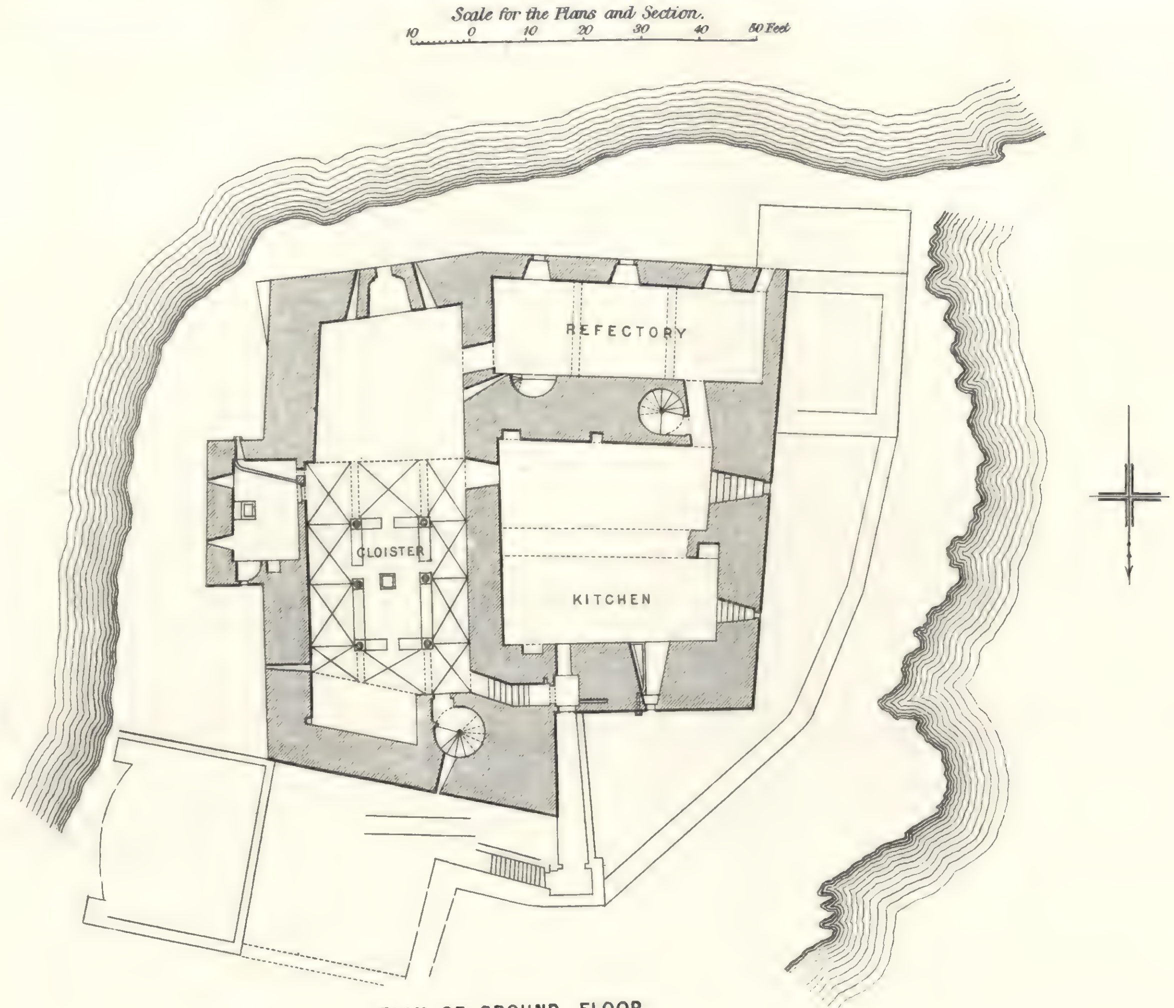


THE CASTELLATED MONASTERY OF SAINT-HONORAT-DE-LÉRINS.

[see page 82]



SKETCH FROM THE NORTH-WEST.

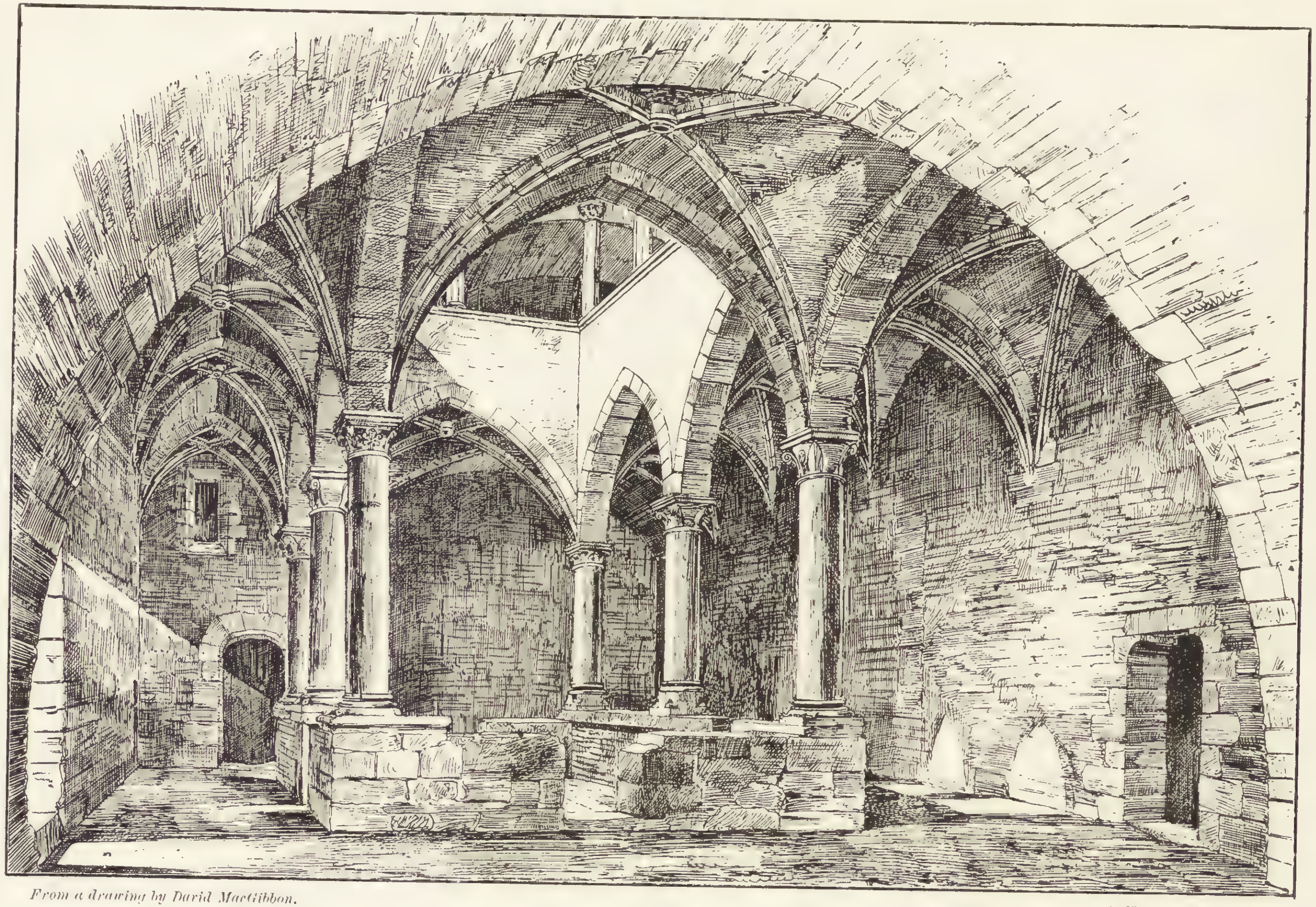


PLAN OF GROUND FLOOR.

From drawings by David Mac Gibbon.

C F KELL, LITHO, 8, FURNIVAL ST HOLBORN, E.C.

LXVII THE ARCHITECTURE OF PROVENCE (xvi).



From a drawing by David MacGibbon. *A. Needham Wilson del.*

THE CASTELLATED MONASTERY OF SAINT-HONORAT: LOWER CLOISTER, FROM THE SOUTH-WEST.

[See page 82.]

From a drawing by David MacGibbon. *A. Needham Wilson del.*

THE CASTELLATED MONASTERY OF SAINT-HONORAT: UPPER CLOISTER.

[See page 82.]

LXVII. THE ARCHITECTURE OF PROVENCE (xvii).

From a drawing by David MacGibbon. *A. Needham Wilson del.*

THE CASTELLATED MONASTERY OF SAINT-HONORAT: LOWER CLOISTER, FROM THE SOUTH-EAST.

[See page 82.]

of the Cistercian style of the twelfth century, and of the castellated and Gothic architecture of the fourteenth and fifteenth centuries, as likewise of the Italian Gothic of the fifteenth century, while in the military barbarisms of the Spaniards we trace the rude and destructive operations of the sixteenth century. On this little island we have thus an epitome of the varied architecture of Provence.—DAVID MACGIBBON.

*** The Discussion [see verbatim report in *The R.I.B.A. Journal*, vol. vi., pp. 89–92] of Mr. MacGibbon's Paper was opened by the Chairman, and continued by Mr. R. Phené Spiers, F.S.A., Mr. W. White, F.S.A., Mr. E. P. Loftus Brock, F.S.A., Mr. E. J. Tarver, F.S.A., Mr. Campbell Douglas, Mr. A. Needham Wilson, and Mr. H. W. Burrows. A brief abstract of their remarks and of the reply made by the author of the Paper is here appended :—

Mr. J. MACVICAR ANDERSON, *Vice-President*, remarked how interesting it was to see the Roman characteristics of the earlier buildings growing into Romanesque, to be eventually superseded by the Gothic from the North. He considered the massive simplicity of many of the buildings most striking, and thought it a feature to be remembered in the present days of luxury and ostentation.

Mr. R. PHENÉ SPIERS, F.S.A., *Member of Council*, agreed that the style took its form almost entirely from the old Roman work, and was not affected by Byzantine influence. He was of opinion that in those earlier periods the great pride of the mason was to imitate something that he had before him. The porch of Notre-Dame-des-Doms was simply a copy of the Roman bridge of Chanas, in Provence. In the porches of Saint-Trophime and Saint-Gilles, at Arles, an arrangement of columns side by side against a blank wall was seen which might have suggested the similar arrangement in Saint-Mark's, Venice. He thought that Saint-Front, at Périgueux, was certainly a copy of Saint-Mark's, Venice—at any rate, as far as the plan was concerned; but its vaulted construction showed that the workmen did not know how pendentives were formed, and therefore they trusted to their own knowledge and resources. In most of the churches in Aquitaine domes were to be found; and so different were they from those to be seen elsewhere in France, that there must have been some strong Byzantine or foreign influence at work in that part of the country. He had expected to see photographs shown by the lime-light, but found the pen-and-ink perspectives quite stood the ordeal.

Mr. WILLIAM WHITE, F.S.A., *Fellow*, said that not only was local architecture copied by strangers and new-comers in a district, but a great deal was taken back by them to their own country. In this case, as in Cyprus, first came the Phœnicians, then the Greeks, then the Romans, followed by other succeeding elements which affected the whole of the architecture of the district.

Mr. E. P. LOFTUS BROCK, F.S.A., *Fellow*, called attention to one feature in Southern or Italian Gothic which did not receive the attention it deserved, namely, that Pointed work erected under a permanently sunny sky, instead of being delicate and aspiring, was heavy in its mass and unaspiring. A curious fact brought out by the Paper was the decline and fall of the beautiful Provençal school of carving on the cessation of the classical style. The great bulk of the carving, such as in the statuary of Saint-Trophime, was nearly exactly like that of late classic times, with differences of costume.

Mr. E. J. TARVER, F.S.A., *Fellow*, suggested that the later developments of such Romanesque work would be better described under local names.

Mr. CAMPBELL DOUGLAS, *Member of Council*, said that sketches were better for some purposes than photographs, for he who made a sketch of an object retained a mental photograph of it

on the retina of his mind. He preferred a photograph of the whole for general effect, but a sketch for details, so as to grasp the grammar of the building; and considered drawings of a building more useful to posterity than a simple photograph.

Mr. A. NEEDHAM WILSON, *Associate*, asked Mr. MacGibbon if he could explain the paucity of the Romanesque at Nîmes, and whether the distinctly pointed arch to the doorway of Saint-Trophime did not indicate that it was of later date than that of Saint-Gilles.

Mr. H. W. BURROWS, *Associate*, hoped some information might be given as to the connection between the architecture of Provence and England, and the growth of Cistercian architecture in the latter.

Mr. DAVID MACGIBBON, in reply, stated he did not say Saint-Front-de-Périgueux showed no Byzantine influence, but that there was not sufficient ground, in the fact of it being copied from Saint-Mark's, to support all that French authors wished to found upon the resemblance. He agreed with Mr. Loftus Brock in the necessity of tracing the differences between the Northern and Southern Gothic. As to sketching, he considered that it was of very great moment for the architect himself; but in illustrating a Paper a carefully prepared photograph shown by lime-light gave a fuller representation than a sketch.

LXVIII.

THE RENAISSANCE IN NORTHAMPTONSHIRE.

By J. Alfred Gotch, *Fellow*.

Mr. Arthur Cates, *Vice-President*, in the Chair.

Mr. Vice-President and Gentlemen,—

THE influence of Italy over the Arts and Literature had obtained a complete footing in England towards the middle of the sixteenth century. Epidemics spread with less rapidity in those days, and it took a great many years for the English to catch the infection of the classic revival; but once caught, the whole nation succumbed to it. We were soon able to boast, not only of a New Learning, but also of a New Building. It is true that before the century had completed its first quarter, classic detail had been used in architecture, but up to the commencement of the third quarter it can hardly be said to have become prevalent—the Tudor style still reigned supreme. But after 1550, or thereabouts, certainly before 1560, the new forms were universally adopted, and during the next half-century the country was filled with them from end to end. It so happened that just as the soil was ready to receive the new seed, all circumstances favoured its speedy development. The wealth of the monasteries burnt in the pockets of those to whom it had passed; the times were comparatively quiet, thanks to the strong and sagacious rule of Elizabeth; there was a spirit of enterprise abroad which led the landless ones to seek new worlds, and induced their more fortunate relatives who stayed at home to build fine houses in which to establish themselves and their posterity. All the great officers of State, and most of the Court functionaries, amassed enough wealth to enable them to comply with the prevailing fashion. Many of them, though of good extraction, were poor at the outset, and when they became rich, built entirely new houses. Many others, who had ancestral homes, added largely to them. The fashion spread further and further, until there was hardly a house in the land that did not show some work designed in the new style.

In Northamptonshire there happened then to be residing three men peculiarly well fitted to further the prevailing taste. Two of these were great courtiers, who

rose from comparative obscurity to vast wealth and power; the other was an ingenious squire of considerable means and with a passion for building. Lord Burghley and Sir Christopher Hatton lent their lustre to the houses they built. Sir Thomas Tresham gained his from a similar source. These men were the most illustrious builders in the county of that time; but their neighbours were not idle, and to one of them, about whom we have no certain knowledge, except that he was Sir Humphrey Stafford of Blatherwick, we owe what is, perhaps, the most fascinating building of the age—Kirby Hall [Illustns. xxvi–xxviii; also figs. 40–44].

When we examine the details of that period in all parts of the country, we cannot fail to be struck by the capricious way in which they vary in excellence. Sometimes within a few miles of each other—occasionally even within a few yards—may be found work the most delicate and refined, and work the most coarse and clumsy. Priority of execution has nothing to do with it, there is no gradual growth and decadence, no possibility of dating the work by slight changes in the detail or modification of the mouldings. All is arbitrary, and dependent on the whim of the moment. There is probably no building of the period that in all its parts could be recommended as a model. Some of them can only be tolerated as historical evidence. These strictures, however, apply less to Northamptonshire than to other districts. The work here is of more even excellence and of more intrinsic merit, on the whole, than that of any other district with which I am acquainted. The capital stone that abounds in the county may partly account for this; what other reason to assign I hardly know.

This county has always been famous for its Spires and its Squires, and so long ago as the year 1610—that is, towards the close of the period under consideration—one John Norden, who wrote a "Delineation of Northamptonshire," said: "The firtilitie, "Salutarie ayre, pleasant perspects and conveniencie of this Shire in all things to a "generous and noble mynde have so allured Nobilitie to plante themselves within the "same, that no Shire within this Realme can answere the like Number of Noblemen, as "are Seated in those Partes." * He then goes on to enumerate the chief seats of the county, and mentions those of six great noblemen, nine knights, and thirty-eight squires. The probability is, that all of these fifty-three mansions afforded examples of the prevalent style of architecture, and Norden's list is by no means complete. But of the fifty-three some have disappeared and many have been rebuilt in more modern styles, so there remain for us to examine to-night only the following ten :—Holdenby, Burghley, Drayton, Castle Ashby, Rushton, Apethorpe, Dingley, Canons Ashby, Rockingham, and Lilford. Of those not included in Norden's list are Kirby (a most remarkable omission) and a few smaller buildings which it is needless to mention till they come in their due order. Of those which have disappeared, the most notable was Pytcherley Hall, which, after passing through various hands, became the home of the Club that was the headquarters of the celebrated hunt. Not one stone of the

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* "*Speculi Britanniæ Pars Altera*: or a Delineation of Northamptonshire; . . . by the Travayle of John "Norden in the Year M.DC.X" (p. 25).—J. A. G.

house is left, but a good view was published in Baker's History. Of those that have been rebuilt, Kelmarsh Hall was perhaps the finest, judging by the views given in the second volume (p. 40) of Bridges's History.

First among these buildings in order of date is Dingley Hall, of which much has been rebuilt, but which still retains some notable specimens of the early Renaissance. These are the work of one Edward Griffin, Attorney-General to Queen Mary, who purchased the estate in her reign and forthwith began to build. He not only made use of some of the most eccentric mouldings that were ever devised [Illustn. xix], but adorned his work with highly curious inscriptions. On the principal porch occur, "Ano 1558, "in the rayne of Felep and Marey. Post tenebras spero lucem. After darkness "cumeth light. E. G.—A. G." There are not many buildings bearing the information on their face that they were built in the reign of Philip and Mary and as for the other part—"after darkness cometh light"— whether it referred to the fact that Mary had succeeded Edward on the throne, or to the builder's emergence from obscurity, or whether it meant to say that he had left the law-courts for the country, it is impossible to determine. Upon the gateway to the Arcade [Illustn. xix] are other inscriptions, so terribly misspelt as to occasion much difficulty in deciphering them. They are couched chiefly in the Latin tongue, according to the prevailing custom. The most noteworthy is one that turns out to be two hexameter lines,—

> Invigilate viri, tacito nam tempora gressu
> Diffugiunt, nulloque sono convertitur annus,

giving expression to an idea that frequently flowed from Elizabethan pens,—the flight of Time,—"Watch, O men, for time flies with a silent footfall, and the year "changes without a sound." The inscriptions end with "God save the King 1560." What king was there in 1560? Are we to look upon this as a political manifesto in favour of Philip? or is it merely one of the blunders that so constantly occurred in inscriptions, and which seem to point to the opinion that the carvers must have been unable to decipher the architect's instructions?

From Dingley we must make our way to a different part of the county, and visit Burghley House, by Stamford. Not that what we now see of Burghley is next in date, but because there was building of some kind going on at this time and even earlier. This we gather from letters, preserved in the State Papers, written by workpeople at Burghley to Sir William Cecil in London. These letters, in common with others relating to Holdenby House, Hatfield House, and Cobham Hall, throw some light on the methods of procedure in connection with the building of the great Elizabethan Houses. The workpeople applied direct to the owner for instructions, and many details were referred to him for settlement with which we architects should never trouble our clients. Of the architect of these buildings, as such, we never hear a word. A surveyor is sometimes mentioned as going to inspect, but he is not always the same man. The owner apparently arranged everything and furnished the drawings, the carrying out of which was entrusted to a foreman or clerk-of-the-works, who hired

the workmen on behalf of his master. The details seem to have been generally left to the fancy of the various artificers, who probably carried out the small scale drawings supplied by the architect according to their own lights, though occasionally we meet with requests for full details. We can imagine John Thorpe, for instance, in his office in St. Martin's Lane, sending across to Sir William Cecil at Canon Row, Westminster, the ⅛-scale drawings of Burghley—for Thorpe's plans we have, though not his elevations of that mansion. And we can then picture to ourselves Sir William forwarding them to Peter Kempe, his foreman at Burghley, who in his turn gave them to Roger Warde, the mason. Whether Thorpe ever went down to see how the works were getting on we do not know. But we do know that he went to Kirby, for he states that he laid the first stone of it in 1570; whether that was likewise the last stone that he laid or saw, there is no record to tell. But of the building of Burghley we get curious glimpses from the State Papers. Roger Warde, the mason, writes to Sir William Cecil on the 13th June 1556: "Right worshipful, my duty remembered, this "shall be to advertise you that I do understand your pleasure is to have 3 lucarne "[dormer] windows for your inner court, but I cannot understand by John Norris "after what sort you would have them; but, as I do understand by his talking, you "do intend to have them after the same mould that the bay window is made by, but "whether you do think to have them of the same width that it is or not, I cannot tell, "therefore I shall desire you to draw your meaning, how and after what fashion you "would have them to be made in all points, both the width of the light and also the "height of the same, with the fashion of all the moulds that doth belong thereunto, and "in what place you would have them to stand; and your pleasure known, I shall do "the best it lyeth in me to do." * Further on he wants to know what kind of a gable is to surmount the dormer window, and he says, "therefore I shall desire you to draw "a trick of the upright [or, as we should say, a sketch of the elevation] for your "lucarne window, and the gable-end over it."

Then in 1561 (*i.e.* five years later), Peter Kempe, the foreman, sends Sir William "a trick of the brewhouse" for his consideration, he reports the progress of the works, asks for instructions as to the floor levels of the pantry and my lady's chamber, and remarks that the rainy days have enabled them to work a good store of ashlar. Later in the same year he sends a "trick" of a basin that he was proposing to make, but apologises for its shortcomings, saying that "it is not very sightly, for that I am "not cunning in drawing." Peter Kempe is the principal correspondent of Sir William Cecil, and there are various letters † of his during these years, addressed, "To y^{e} Ryght "honable and my syngular good Mr. Sir W^{m} Cecill," containing reports and asking for instructions, as though Sir William were the architect instead of the owner. Besides these letters from Kempe, there is one dated 1564 from an Edmund Hall, apparently a surveyor, reporting progress and making various suggestions. Then, again, in 1569

* From the *State Papers*, *Domestic*, Mary, vol. ix. No. 4. The spelling is modernised [see Appendix, p. 103].—J. A. G.

† See pp. 105–107.—J. A. G.

Thomas Cecil, a son of Sir William, is at Burghley reporting progress, and after this we have an interval of some nine years, till, in 1578, Richard Shute reports progress, no longer to plain Sir William Cecil, but this time "To the right honorable his singular "good L. and Mr. the L. Burghley, L. highe Threr of Englande and one of the Lords "of her Ma[te] privy Councell."

From the nature of this correspondence we might be inclined to think that Sir William Cecil was his own architect; but we know that there were men, like Thorpe, and John Shute, and Henryck, who practised in some kind of way as architects, and very likely provided drawings as required, which they sent to the owner for transmission to the works, leaving them to be worked out as best might be by the local workmen. We have seen how Thorpe made the small-scale drawings for Burghley House, and we gather that Henryck was also employed by Lord Burghley on some of his work, inasmuch as among the State Papers is a drawing to a scale of about one inch to the foot, endorsed in the Lord Treasurer's hand "Henryck's platt of my "baye wynd," which may very well have been a detail supplied by Henryck for his employer.*

Fig. 38.—Remains of one of the Towers, at Wothorpe.

Not far from Burghley is the much smaller, but still notable house at Wothorpe, the dower-house of the Burghleys, and built, about 1600, by the same Thomas Cecil whom we heard of as reporting to his father on the state of Burghley in 1569. He built it, as he jestingly said, "only to "retire to out of the dust while his great "house of Burghley was a-sweeping." It was dismantled in 1759, and is now in ruins, little besides the towers remaining; they recall those at Burghley in their appearance, but the detail is somewhat later [fig. 38].

Far larger than Burghley was Sir Christopher Hatton's palace at Holdenby, which was approaching completion at the time that Richard Shute was reporting the progress of the former.

The Lord Treasurer, as might be expected, took a great interest in his neighbour's enterprise, and in the year 1579 we find him asking Mr. Secretary Walsingham to tell Sir Christopher that he meant, being in the neighbourhood, to survey Sir Christopher's house at Holdenby. To this intimation Sir Christopher replied, welcoming

* *State Papers, Domestic, Addenda,* Elizabeth, vol. xxv. Case H, No. 15.—J. A. G.

his guest, and apologising for the unfinished condition of the house. He then goes on to say: "I humbly beseech you, my honourable Lord, for your opinion to the Sur-"veyor of such lack and faults as shall appear to you in this rude building, for as the "same is done hitherto in direct observation of your house and plot at Tyball's, "(Theobalds), so I earnestly pray your Lordship that by your good corrections at "this time it may prove as like to the same as it hath ever been meant to be."*

Far from finding it a rude building with much "lack and fault," the Lord Treasurer had for it nothing but commendation, and, in his opinion, Theobalds was only fit to be a foil to it. He then adds a sentence which affords some explanation of the immense amount of magnificent building which was then being carried on through-

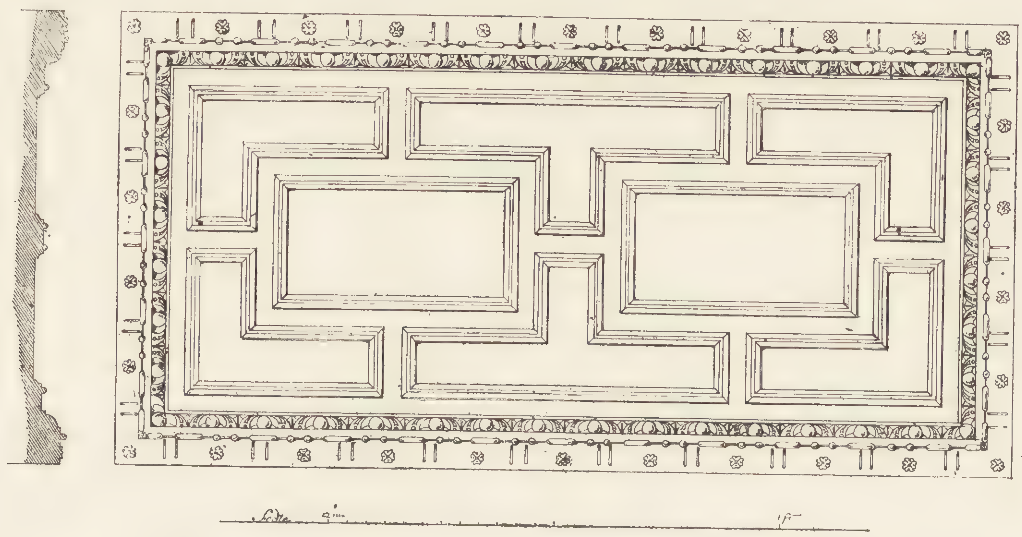


Fig. 39.—Plan and Section of a Panel in a Screen at Holdenby.

out the country. "God send us both," he says, "long to enjoy Her" (meaning the Queen), "for whom we both meant to exceed our purses in these."

It is interesting to find one great officer of state, himself a notable builder, thus visiting the work of another great officer, and taking with him a third, in the person of Sir Walter Mildmay, of Apethorpe, Chancellor of the Exchequer, whose family in their turn indulged in the same lordly tastes, and enlarged their house some forty years later, leaving behind them work which we are to examine to-night.

Lord Burghley was not alone in his commendation of Holdenby, for Sir Thomas Heneage, who was also an officer of state and the builder of a fine house at Copthall, in Essex, wrote, some four years after the Lord Treasurer's visit, in high terms of the mansion. In his opinion, Holdenby "is altogether even the best house that hath "been built in this age;" and elsewhere, "it is the best and most considerate built

* Landsdowne MS. 28. This and the other letters relating to Holdenby are given in *Memorials of Holdenby*, by Emily Sophia Hartshorne.—J. A. G.

LXVIII. THE RENAISSANCE IN NORTHAMPTONSHIRE. (xix)

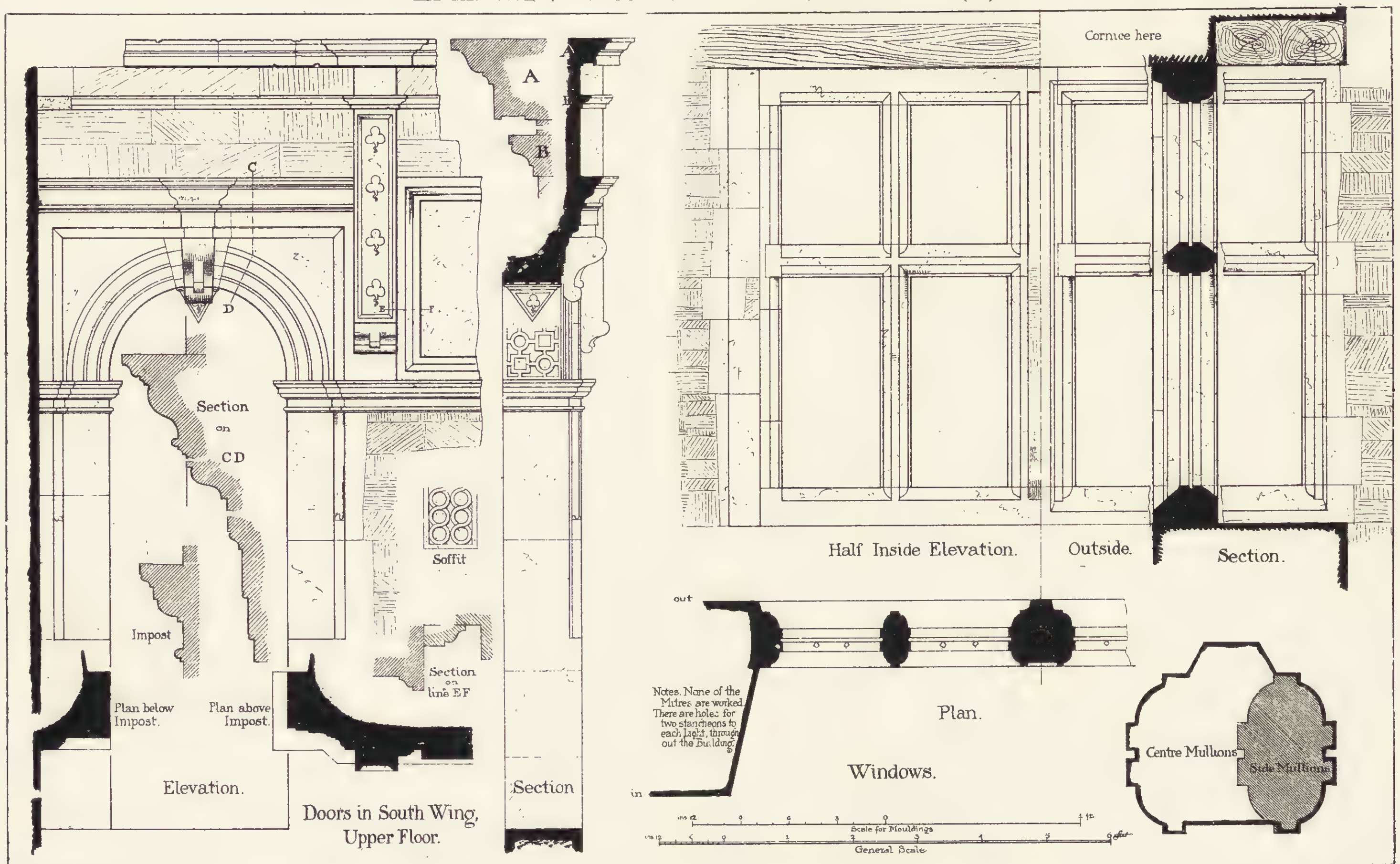
DINGLEY HALL : GATEWAY TO THE ARCADE.

[see page 89.]

J. Alfred Gotch del.

C F KELL PHOTO-LITHO. 8, FURNIVAL Sᵀ HOLBORN, E.C

LXVIII. THE RENAISSANCE IN NORTHAMPTONSHIRE. (XX)



J. Alfred Gotch del.

C. F. KELL, PHOTO-LITHO. 8, FURNIVAL ST HOLBORN, E.C.

LYVEDEN NEW BUILDING: DETAILS.

[see pp. 95, 97.]

LXVIII. THE RENAISSANCE IN NORTHAMPTONSHIRE (xxi)

From a photograph.

LYVEDEN NEW BUILDING.

[See pp. 95, 97.]

"house that yet mine eyes have ever seen." The same opinion is repeated, in varying language, in every account of the place that we meet. Camden and Norden are both enthusiastic, the latter especially dilating on the glories of the place.* But they are all gone now, indeed even so far back as 1722, when Edmund Gibson published his edition of Camden,† there was hardly one stone left upon another; while to-day the grass alone dimly records the extent of the house, except that a small part of what was the servants' wing survives, and so do the two arches that indicate the width of

Fig. 40.—Gable at Kirby Hall (East Side).

Fig. 41.—Chimneys at Kirby Hall (East Side).

See Illustns. xxv, xxvii, xxviii.

the forecourt. The only illustration of it I can give is that of a wood panel from the screen, formerly in the palace, and now in the church of Holdenby, the original of which (in the possession of Colonel Lenox Prendergast) was measured and drawn by Mr. Albert Hartshorne in October 1863 [fig. 39]. It is worthy of note that Holdenby, and Theobalds, which was more or less the model for it, were purchased by James I., and became royal palaces.

It might have been thought that so vast a place as Holdenby would have been

* In his *Delineation*, p. 49.—J. A. G.

† Camden's *Britannia*, published by Edmund Gibson, 1722, vol. i. fol. 517–518.—J. A. G.

sufficient to serve as the country-seat of even a courtier of Elizabeth. But the dancing Chancellor possessed another within the same county, obtained by purchase from the builder of it, namely Kirby Hall. At the time of his building Holdenby and of his buying Kirby, he was but Vice-Chamberlain; it was not till 1587 that he became Lord Chancellor, and "led "the brawls" at one or both of his great homes. In September 1580 Sir Christopher writes to Sir Thomas Heneage that he is about to take his way "to "Sir Edward Brudenell's to view my "house of Kirby, which I never yet "surveyed; leaving my other shrine, "I mean Holdenby, still unseen until "that holy saint" (meaning Elizabeth) "may sit in it to whom it is dedi-"cated."* In 1580, therefore, Kirby had already passed from Sir Humphrey Stafford to Sir Christopher Hatton. It was not more than ten years since the first stone was laid; at least five of those ten were occupied with the building; and yet, without any known reason, it changed hands. That the whole of the main part of the house was built by the Staffords there can be no doubt, for the Stafford crest and cognisances appear on the parapet, as well as the words HVM FRE STA FARD. The bosses of the ceilings also bore the Stafford crest, and it would therefore seem that the whole house was completed by Sir Humphrey, and then suddenly sold to Sir Christopher.

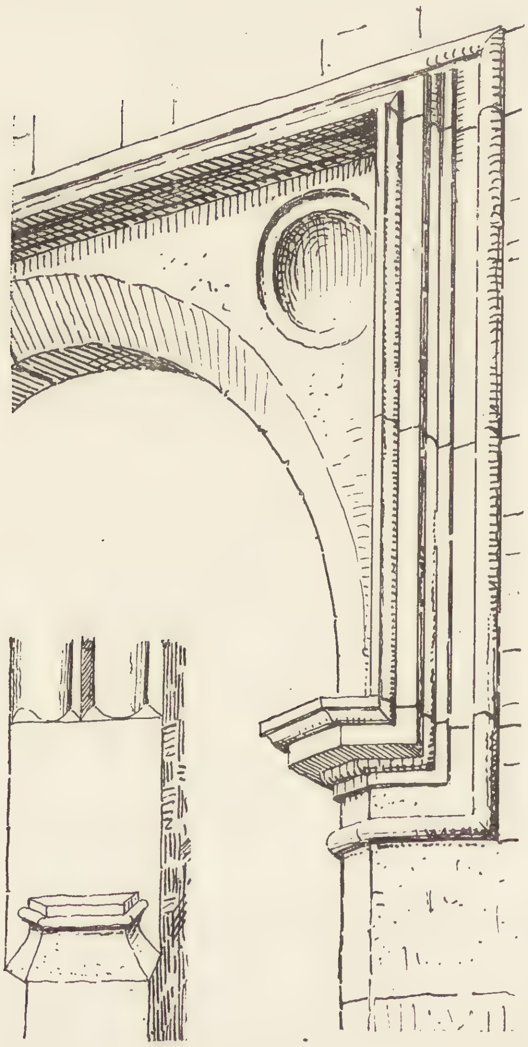


Fig. 42.—Stone Moulding and Stop.

Fig. 43.—Impost carried round as Architrave.

KIRBY HALL.

Of the history of Kirby little can be traced beyond what can be gathered from the building itself. The references to it are few and far between, and of no great importance when discovered. From Thorpe's plan we know that he laid the first stone in 1570; on the building itself occur the dates 1572 and 1575, which indicate a period of continuous activity. About 1580 the house changed hands, and subsequently

* Harleian MSS. quoted in *Memorials of Holdenby.*—J. A. G.

to that date there seem to have been various extensions, still in the early or Thorpe style, among which were the stables, dated 1590, but now destroyed. Fifty years later, under Inigo Jones, another period of active building set in, but his hand was the last to touch it, save that the ever-present hand of Time has been heavy on the place, and threatened, till within the last year, to reduce Kirby to the same state as its brother Holdenby; but, fortunately, the judicious care of the present owner, while scrupulously avoiding anything in the shape of restoration, is preventing, so far as possible, any further defacement, not only from "Time's fell hand," but also from the hand of the beanfeaster, which profanes as well as defaces.

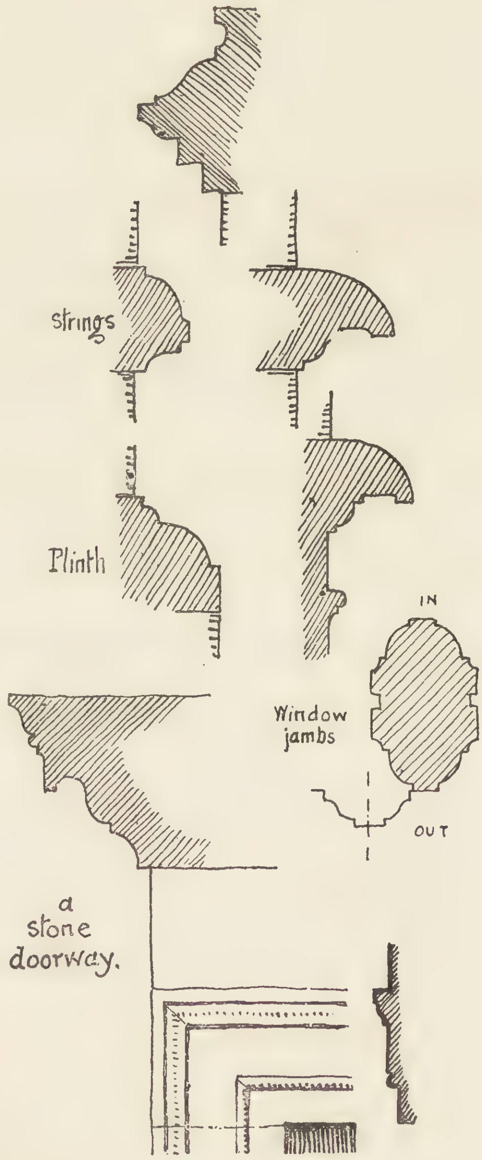


Fig. 44.—Stone Details at Kirby Hall.

We have seen John Thorpe in person at Kirby, we have seen his plans of Burghley and of Holdenby: there is yet another link connecting him with the county in the shape of Lyveden New Building [Illustns. xx, xxi]. This excellent piece of work was built for Sir Thomas Tresham, of whom we have already spoken. Thus far, the houses which illustrate the Renaissance in Northamptonshire have all, with the exception of Dingley, been intimately connected with each other, either by ownership or by the friendship of their builders. But while they were being built, during the years that went to the erection of their wide-extending walls, there were being devised in another part of the county, buildings of less extent but of hardly inferior interest. Sir Thomas Tresham was a man of good descent, of considerable wealth, and of great ability. By education, he was inclined to the unpopular Roman Catholic Faith, and this preference it was that has left an indelible mark on all that he did. About the same time that Burghley was half way up, that the works at Holdenby were in full swing, and the parapets at Kirby had been

fairly carved with their curious wave-like pattern, he was proposing to present to the town of Rothwell a new market-house, out of respect to the town, and love of his own county, as well as for the purpose of honouring his friends, whose arms he caused to be carved upon it. This laudable intention he only carried out to a certain extent, for before the building was finished, the ill-fortune which marred all he did crossed his good intentions, and he was cast into prison for conscience' sake. From that day to this, the market-house has never had a roof. In some respects it is a typical Elizabethan building; in its pilasters with their quaint raised ornamentation, in the extent of its windows, and generally in its appearance of elaborate richness; and though its detail is coarse, and would shock the diligent student of the five Orders, yet there cannot be denied to the whole composition the merit of vigour and piquancy [fig. 45]. From the year when he was cast into prison, 1580—the same in which Sir Christopher Hatton first saw Kirby—till the day of his death, in 1605, Sir Thomas Tresham's life was one of alternate imprisonment and release. It was, no doubt, in the seclusion of his various cells that he brooded over the quaint designs for the Triangular Lodge and Lyveden New Building. How the former sets forth the doctrine of the Trinity, and the latter that of the Passion, has often been pointed out.

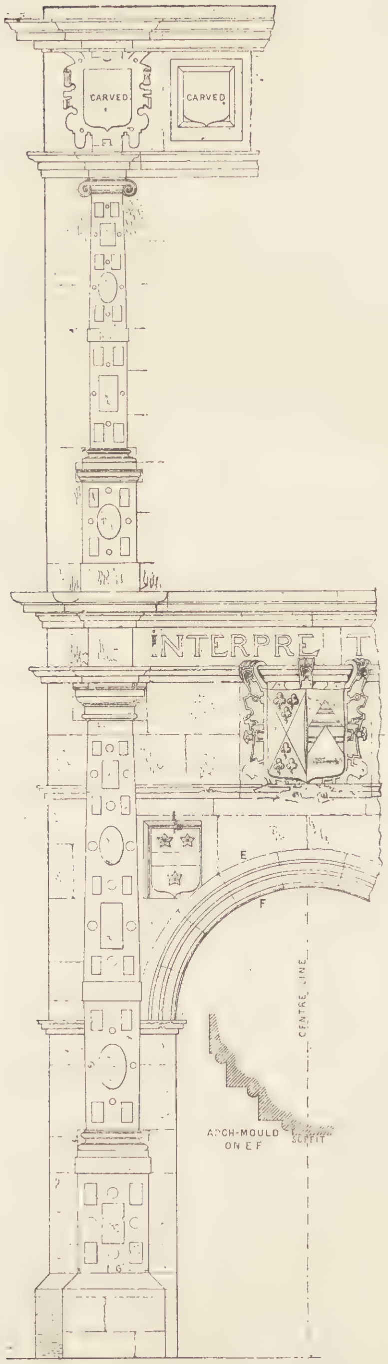


Fig. 45.—Rothwell Market House.

The Triangular Lodge affects different architects in different ways. Some despise it, and resent being taken to waste their time beneath its useless and puzzling walls. Others, again, are pleased with its beautiful seclusion, with the gaily-coloured veil that Time and the trees have thrown over it; they fall to deciphering its puzzles with interest, and, forgetting for a few moments that they are architects in search of workable ideas, they give way to their antiquarian proclivities, and are pleased to stay and examine this extreme type of the quaint conceits that abounded in the days of Elizabeth [Illustn. xxii].

The dates on the Lodge are 1593 and 1595, which correspond with those on certain parts of

Rushton Hall, where the Treshams lived, and perhaps also with Lyveden New Building. I say "perhaps," for there is no official date upon it, but on one of the door-jambs in the basement there is dimly visible a date scratched by some visitor, which might either be 1591 or 1597. From this we must conclude that already by that time the place was left to take care of itself. But, however that may be, the same fatality which attended the rest of Tresham's work interfered here, and prevented the building from ever being finished. The excellence of the workmanship, however, has served to keep most of the walls in nearly the same state as when they were abandoned, and much of the detail is as sharp now as when first it was cut [Illustn. xxi].

This house, for such it was intended to be, is a notable piece of work. Its bay windows alone render it remarkable, and when we come to examine its detail, we find

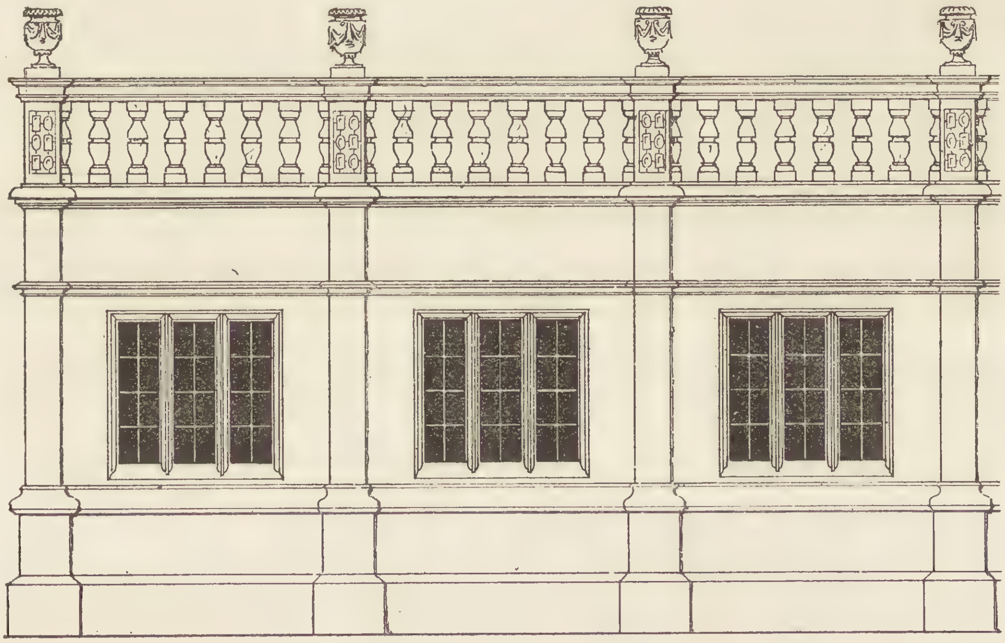


Fig. 46.—Rushton Hall; part of Screen. See Illustn. xxiii.

it not only suggestive, but, so far as the two main cornices are concerned, of a refinement unsurpassed by that in any building of the age. Time will not permit of an exhaustive description of the curiosities of this house, and they have already been sufficiently dealt with in a work specially devoted to the subject, but I feel satisfied that to any one who can spare a day, a visit to Lyveden will not be time wasted. There are in fact two Lyveden Buildings: the New, which we have seen, and the Old, which is really a plainer structure of about the same date, but standing on the site of an old manor-house of the Treshams. The old building, too, is worth a visit, in order to see its large gable with mullioned windows of many lights, its chimneys, and its handsome oak staircase.

Lyveden was one of the smaller houses of the Treshams; their chief seat was at

Rushton, and here towards the end of the century Sir Thomas was enlarging the house left to him by his forefathers. Two gables are his, they bear his arms, and the date 1595 [Illustn. xxii]; so also is a characteristic chimneypiece in the Library, and a representation of the Crucifixion in what is called the Oratory. All his architectural work is simple, elegant, and suggestive, but in the midst of it he died. Two months afterwards his son and heir lay in prison for complicity in the Gunpowder Plot, and the house and estates passed from his family for ever. They came into the hands of the Cokaynes, who proved to be worthy successors. Taking up the work of enlarging the house, where Tresham dropped it, they added gable to gable [Illustn. xxii], adorning them with their own arms, and dating their work as they went along, till, when they had finished, they left Hall Rushton one of the best specimens of Renaissance architecture to be found in the kingdom. It is dignified and quiet, yet rich where richness tells, and the detail throughout is restrained and free from much of that extravagance marks most of the great efforts of the time [fig. 46].

Fig. 47.—Gable in Courtyard of Apethorpe Hall.

Tresham's work is more severe than that of his successors: his gables are straight, some of theirs are curved, and dated 1626, 1627, 1630. Later work often has these curved gables and finials: we get it again in 1623 and 1624 at Apethorpe [figs. 47, 48], which has already been mentioned, as the home of the Mildmays; and again at Lilford, which (according to Bridges) was built in 1635 [Illustn. xxiv].

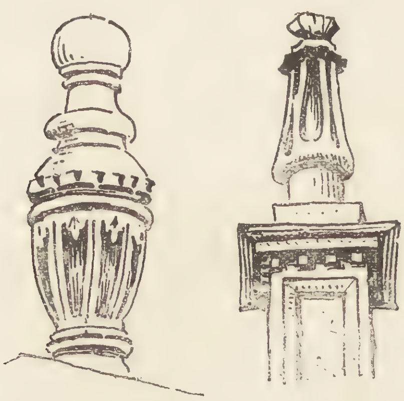


Fig. 48.—Finials at Apethorpe Hall.

Apethorpe is a beautiful place, hardly inferior to Rushton in the antique charm of its house and its gardens. It is built around two courts. One of these dates from early in the sixteenth century, the other mostly from the beginning of the seventeenth. It is said to have been in course of building when James I. stopped there in 1603, but the only dates on the work are 1623—1624. The

old hall, with its screens and its bay window, is still complete, but is now the servants' hall. The daïs was in existence till some years ago, when it was removed to allow greater space for dancing. In the seventeenth-century rooms are many fine ceilings and chimney-pieces; and though the open arcade of that period has been turned into a closed entrance hall, yet Apethorpe preserves about it much of its original flavour, and is one of the striking specimens of the Renaissance in Northamptonshire.

Somewhat resembling Apethorpe in the formality of its front, and in its detail, is Lilford, on the Nene, a few miles from Oundle. Here we have a fine example of the circular bay, not quite so large as those at Kirby, but still striking and stately. There is something, however, in the stiff arrangement of the windows that tells of the tame slavery to which architecture in England was about to succumb. The curious arrangement of the whole of the chimneys in one long straight line must, one would think, cause sad work when the sweeps come [Illustn. xxiv].

But we must hasten on. Crossing the Nene, we come to Pilton, where the Renaissance has left one of its smaller memorials in the shape of a many-gabled manor-house, and thence we must make our way to Drayton.

Here we have a veritable store-house of architecture, from walls and gateways of the Edwards, to

Fig. 49.—At Rockingham Castle.

Fig. 50.—Entrance to Canons Ashby.

pediments and panelling of William III., and book-shelves and woodwork of Queen Anne. But our concern is chiefly with one wing of the house. This is dated 1584, and from basement to attic is of one date. The interior has been remodelled to suit successive generations, the exterior still proclaims its date, but the principal interest lies in the vaulted cellars [Illustn. xxv]. These are described as Edwardian, but a close inspection by candlelight, for the daylight is insufficient, shows them to have veritable vaulting of the days of Elizabeth. The caps of the pillars, the broad-splayed ribs, and, above all, the shields that form the bosses, all show Elizabethan work, and far more interesting it is than had it been of two centuries earlier.

Fig. 51.—Gable at Raunds.

As the ancient house of Drayton was enlarged, so was the still more ancient castle of Rockingham. The long and low garden front is a happy effort, if that can be called effort which seems so suitable to its surroundings. The detail is the same as in all other buildings of the time and neighbourhood, but in a little detached building in one corner of the courtyard there is a combination of windows with a door that is well worth a look, simple though it is—perhaps we might say, *because* it is simple [fig. 49].

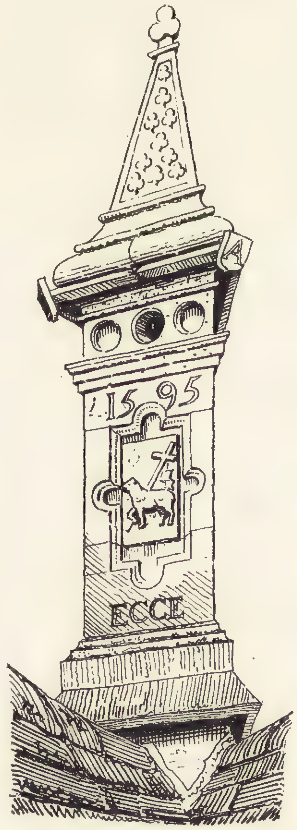
Hitherto we have been traversing the northern part of the county only. Indeed, towards the south there is not much of our particular period to attract us. Two places, however, we must not omit to visit—Canons Ashby and Castle Ashby. The former is a beautiful old house, carefully kept up in the ancient manner by the excellent antiquary who owns it. It presents work of three chief periods —the end of the fifteenth century, the end of the sixteenth, and the beginning of the eighteenth. There is nothing striking about the detail, but the whole of the work has been so blended together by the slow processes of time, the ancient cedars of the gardens and the clipped yews of the green court lend such a graceful air of antiquity to the place, that few houses in the county are better worth a visit [fig. 50.]

WEST FRONT OF RUSHTON HALL, 1595.

[see page 98]

GABLE IN COURTYARD OF RUSHTON HALL.
WORK OF THE COKAYNES, ABOUT 1626.

[see page 98.]



THE CHIMNEY OF
THE TRIANGULAR LODGE AT RUSHTON.

[see page 96]

J. Alfred Gotch del.

C. F. KELL. PHOTO-LITHO, 8, FURNIVAL ST. HOLBORN, E.C.

From a photograph.

RUSHTON HALL

FROM THE EAST.

page 98.

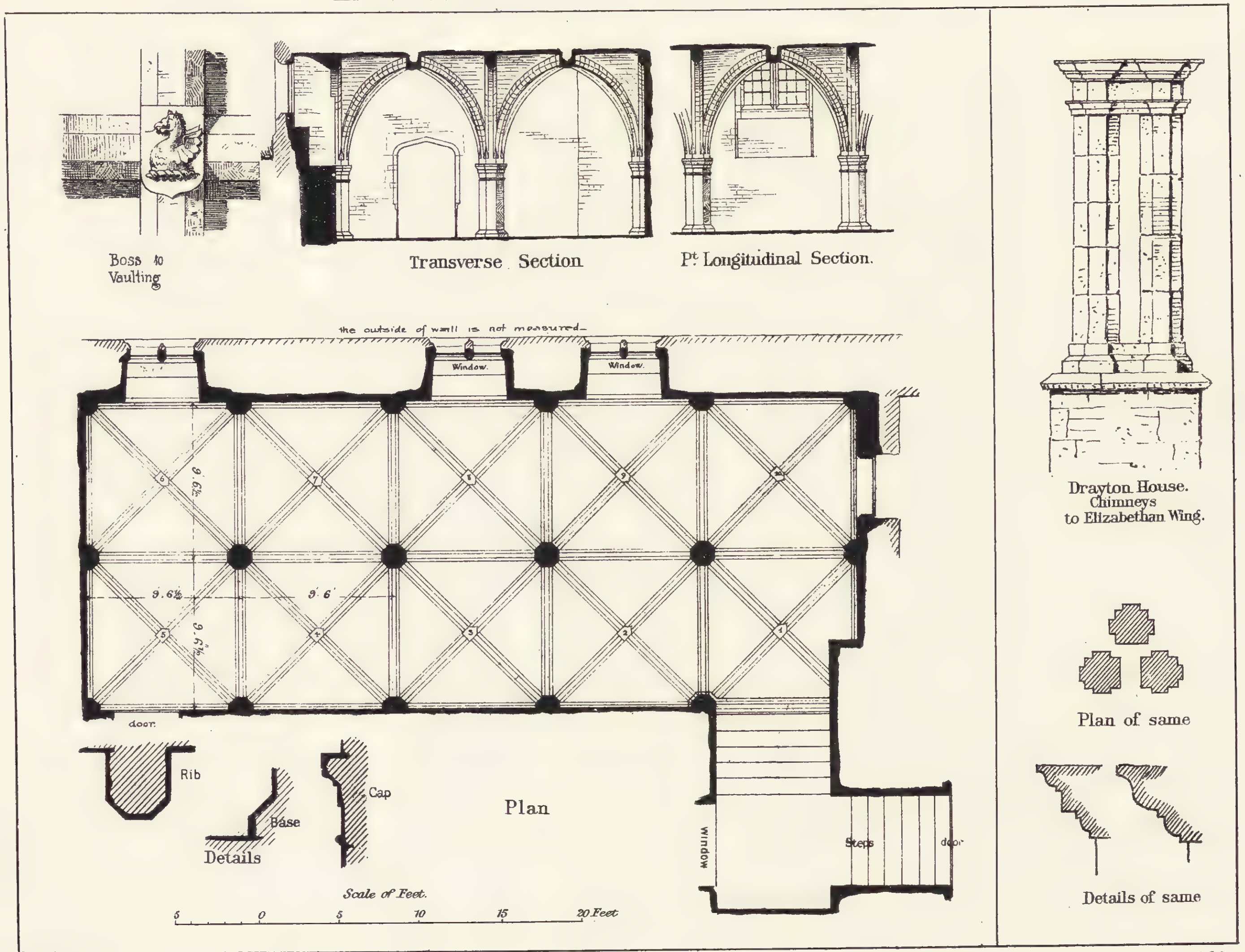
LXVIII. THE RENAISSANCE IN NORTHAMPTONSHIRE (xxiv)

From a photograph.

PRINCIPAL FRONT OF LILFORD HALL.

[See page 93.]

LXVIII. THE RENAISSANCE IN NORTHAMPTONSHIRE. (xxv)



J. Alfred Gotch del.

O F KELL, PHOTO-LITHO. 8, FURNIVAL St HOLBORN, E.C.

DRAYTON HOUSE: THE CELLARS, 1584.

[see page 100.]

LXVIII THE RENAISSANCE IN NORTHAMPTONSHIRE (xxvi).

From a photograph.

A CORNER OF THE COURTYARD AT KIRBY HALL.

[See pages 93-95.]

From a photograph.

ONE SIDE OF THE COURTYARD AT KIRBY HALL.

[See pages 92–95.]

From a photograph.

ARCHWAY IN THE COURTYARD OF KIRBY HALL.

[See pages 93–95.]

From a photograph.

ENTRANCE TO WEEKLEY HOSPITAL.

[See page 102.]

Castle Ashby is, and has always been, since the present house was built, the seat of the wealthy family of Compton, Marquis of Northampton. The house was begun about 1583, and the bay windows of that time are easily recognisable. Of the same period, but a little later, is the chimneypiece in King William's dining-room, dated 1601, and brought from a house in Canonbury. But the fine entrance-screen is the work of Inigo Jones, and is dated 1624, showing it to be contemporary with the curved gables of Rushton and Apethorpe. The passion for placing inscriptions on buildings, which we first observed at Dingley, and which Sir Thomas Tresham experienced in a very striking degree—for all his buildings have long inscriptions on them—is visible here also. The parapet, instead of being formed of balusters, consists of stone letters forming the legend "Nisi "Dominus aedificaverit domum in vanum "laboraverunt qui aedificant eam."

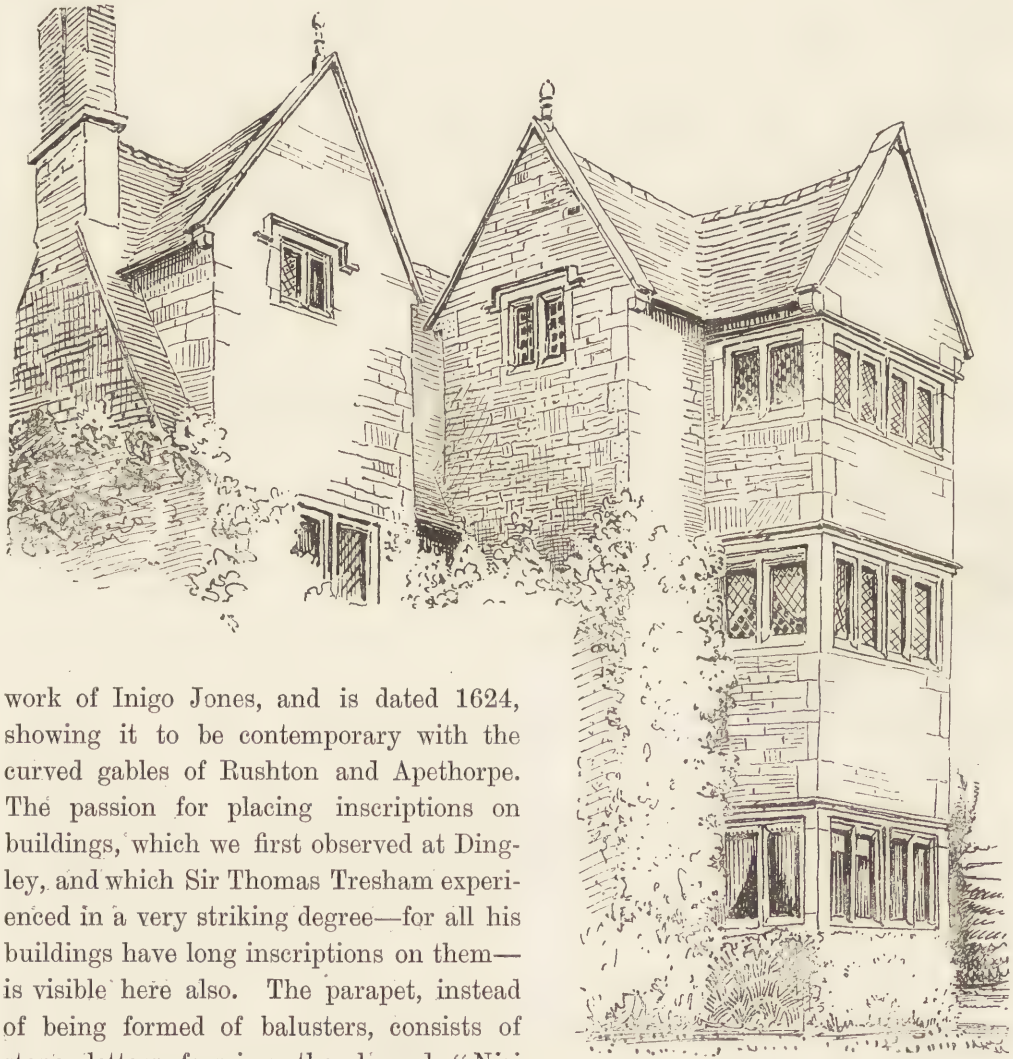


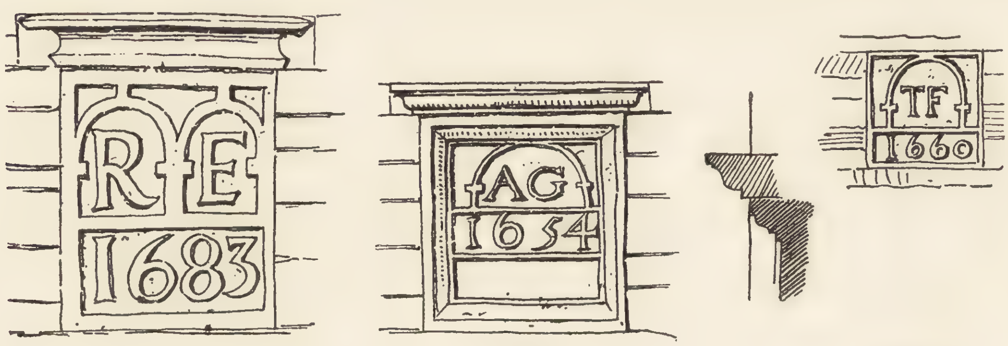
Fig. 52.—King's Sutton Manor House.

With Castle Ashby the list ends of great houses that illustrate the Renaissance in Northamptonshire. But that style impressed itself not only on the great houses. Every kind of building was touched, from the palace of Holdenby to the little cottages of Brigstock and Geddington, and every other village where stone was used [fig. 51].

The manor-houses are nearly all of that period, and that of Great Addington or that of King's Sutton [fig. 52] is but a sample of dozens of others.

The materials of the design are simple enough. Stone-coped gables, with kneelers of various kinds, mullioned windows, flat-pointed doorways, simple date stones [fig. 53], and steep dormers ; these complete the list. But, used as they have been used, and still can be used, they are quite enough to impart architectural character to a building, and there are few districts in England where more suggestive features can be found for stone treatment than that through which we have been wandering to-night. In the great houses the mullioned style gave way in due time to the sash-windowed, but in cottages and small buildings, so thoroughly had it established itself in the district, that it lingered on till the beginning of the eighteenth century.

To one more place I must take you before we end, and that is to the little alms-house at Weekley. It stands on a quiet green adjoining the churchyard, just outside Boughton Park, and almost under the shadow of some great trees that seem to have



Bulwick. Weldon. Twywell.

Fig. 53.—Some Date Stones.

strayed beyond the enclosure. It has a quaint doorway of our period [Illustn. xxix], and above is written a sentence that could hardly have been chosen with greater felicity for the home of the ancient men who lived there. "Tempora labuntur tacitisque sene-"scimus annis"—"Time flows by and we grow old with the silent years." And thus our inscriptions end here, as they began at Dingley, by breathing a characteristic spirit of repose.

The allotted task is done. We have followed the Renaissance in Northamptonshire from the magnificent pile, where a king was kept in honourable confinement, to the humble home where old retainers live on their master's bounty. We have watched it from its earliest growth at Dingley, where it had hardly shaken off its Gothic bonds, down to its last development at Lilford, and even into the new style that Inigo Jones used at Kirby and Castle Ashby. It is the outcome of a fascinating period. All England was quivering with vitality. When Dingley was being built, Spenser was six years old ; when Thorpe laid the first stone of Kirby, Shakespeare was the same age. When Lilford was rising above the Nene, Ben Jonson was still alive. Between the

stoppage of Rothwell Market-house and the beginning of the Triangular Lodge, the great Armada was shattered. While all these structures were growing, a new world was being peopled. It is no wonder that the architecture of the time is interesting. Into the stones of their houses the men of Elizabeth's time hewed their greatness and their simplicity. And yet with all the eagerness that marks the age, there seems to us of this rushing era to have been much more repose than we can ever hope for. Peter Kempe and Roger Ward, and even the busy John Thorpe, seem to belong to another world; and we, who are dragged this way and that way in the fierce currents of competition, can hardly help lamenting, as we look back on that golden age, that it is not given to us, as it was to them, "to grow old with the silent years."

J. ALFRED GOTCH.

Appendices.

The Building of Burghley House.

THE following letters are selected from several preserved among the State Papers. They are the most important and interesting of those relating to the Building of Burghley. They show plainly how much Sir William Cecil was consulted by those on the spot, and how even trivial details were referred to him for decision. There is some difficulty in reconciling features and dimensions, mentioned in the various letters, with anything in the present Burghley House; and yet there is no record of a former house on the same site, more especially of a house preceding the present one by only a few years. The earliest date on the house is 1575. Some of these letters were written in 1556, some in 1561–4. Only one—the last—bears a date subsequent to 1575. Already in 1556 the workmen were ready for the "lukon" (*lucarne*) windows of the inner court, and yet twenty-two years later, in 1578, with the works progressing in the interval, the masons' work was not fully completed. But whether the letters all refer to the existing structure or not, their chief interest lies in the light they throw upon the relation in which the building proprietor stood to his workmen. Of the writers themselves, the principal is Peter Kempe, whom we should designate as clerk-of-the-works; Abraham was probably his predecessor; Roger Ward was a mason; Edmund Hall and Richard Shute were surveyors, sent down to report. The commending of the employer, in nearly every letter, to the Powers above, would perhaps be regarded as a little out of place in the present day.—J. A. G.

"State Papers, Domestic," Mary, Vol. ix. No. 4.

Ryght worshypfull my dewty Remēberyd thys shalbe to advertyse yow that I dowe understand youre plesewre ys to have iij lukon wyndows for youre inercowrt but I cãnot understand by Johne

nores after what sort yow wolde have them but as I dowe understand by hys talkeyng yow dowe intend to have them after the same molds that the beye wyndowe ys mayd by, but whether yow dowe thynke to have them of the same wyde that hyt ys or not I cane nott telle, therfore I shall dyssyer yowe to drawe yowre menynge how and after what facyon yowe wolde have them to be made in all poynts bothe the wyde of the lyght and allsoe the heght of the same, wythe the fassyon of all the molds thatt dowthe belonge there vnto and in what plaice ye wolde have them to stande, and yower plessewre knowne I shall dowe the best y^{t} lyethe in me to dowe I wold be verye glade to knowe yowre plessewre for yore sters forthe of yowre basse kowrt up to the tares [terrace] and for the proporcion of them and allso for the gatte att the ende of ye tares wythe the proporcion of the same bothe for the heght and wydthe that yow wolde have theme of I wolde gladlye understande youre mynde after what facion yow wolde have the gabyllende over the lucan wyndow therefore I shar dyssyer yowe to drawe a tryke of the upryght for youre lucan wyndowe and the gabylle end over hytt that I ma the better understande yowre plessewre in all thyngs y^{t} ye wolde that I shulde dowe. I thynge yowre owne stone ys to soft for to make any sters of hytt the best stone y^{t} I dow knowe for stepe or sters ys att clypsame. the lyvynge god kepe yowe ever more frome all evyll & my goode Ladye w^{t} all y^{e} rest of yowre worshypfull howse.

frome burlaye the xiij of June. By yowre at all tyme to cōmande Roger Warde mason.

[Addressed] To the Ryght worshypfull Syr Wyll^{a}m Cecille Knyght at the canan rowe in Westmynyster gyve thys wythe speyde.
at London.

[Endorsed] 1556. Junij Ro. Ward.

"State Papers, Domestic," Mary, Vol. ix. No. 5.

My duetie considered & most humbly promised to yo^{r} maistershype beyng verye sorye to und^{r}stande y^{t} yo^{r} maistershipe is displesed for y^{t} yo^{r} buyldynges are in no more redines & y^{e} same to be judged my necligence or evell applyeng of yo^{r} workemē. I can neyther let any man to writt neyther to say y^{r} myndes but sure I am y^{t} yo^{r} workes are corespondente to yo^{r} m^{r}shippes charges or elles let it be rekoned to be my fawte yee my slowthefulnes w^{t} yo^{r} mais^{r}hippes dispesure wiche I woulde not have for ye wholl borowgh of Stamford but some be of suche nature & so moche desire thankes y^{t} y^{a} will seke for them with other menes dispesores yee almost to y^{r} undoynges as it shulde by myn to have yo^{r} maistershypes dispesure I beseche god y^{t} I never lyve to have it I pray yo^{r} M^{r}shippe to pardone this my folyshe & rude talke y^{t} is so rashe for yo^{r} buyldynges are not so far out of order but now we havyng plast^{r} sex loodes burntt upon thrusedaye last & have done y^{e} particion over wher yo^{r} skrene shall stande & almost yo^{r} pantre, & to morow m^{r} barteleyes tenentes bryng to Burghley all yo^{r} plaster y^{t} is at Sesterne m^{r} Willyams man said y^{t} y^{r} was in all xxxij loodes & this weke by godes grace shall y^{e} flores in yo^{r} galere be maid & y^{e} rooffe seled plast^{d} I shuld have said) & after other thynges with suche spede as may be, yo^{r} kechyng roiffe wyl be y^{e} greatest pese of worke y^{t} is to be done but we shall have this weke iiij carpinters to helpe a bowte y^{e} same worke although workemē are dere w^{c} hathe partely caused me to for bere hyryng of workemen & agane partely because yo^{r} m^{r}shipe dyd writt y^{t} ye purposid not to com to burley before y^{e} xviij of July & by y^{t} tym yo^{r} owne carpinters woulde have done those thynges y^{t} y^{a} had in charge & so to have spared some money. hall hathe mesured betwene yo^{r} hous & y^{e} freres cundithe with a corde of xxx yerdes in lenght & y^{r} is betwane yo^{r} hous & y^{e} cundith xlv cord lenghthes & betwene yo^{r} house & yo^{r} owne cundyth xxij cord lenghthes hall hathe a molde y^{t} wyll agree with yo^{r} pype in wydines and every yerde of his pipe wyll take of leade xvij^{li} & besids yo^{r} owne pype hall thynkyth y^{t} v fothers of leade wyll go thorow to y^{e} freres cundith. & hall saithe y^{t} he wyll do y^{e} workemanshipe havyng all thynges therto belongyng upon yo^{r} charges for xx markes & otherwyse he saithe he can not lyve to do it. betwene yo^{r} skrene & y^{e} halfe pace in yo^{r} hall is xx foote & ix inches & y^{e} table y^{r} is xv foote & di[midium] betwene y^{e} halfe pace & y^{e} dore is iij foote, y^{e} other side table may be ix foote & iij foote to spare, y^{e} brethe of bothe y^{e} tables are ij foote ij ynches and di[midium] I have talked w^{t} thomas lockesmyth for yo^{r} rackes & he saith y^{t} y^{a} will take iij c of yron spanyshe wiche may be had at bet^{r}borow of y^{e} best for xij ye c. & he wyll worke it for ij^{d} y^{e} pounde this

thynge would be done but whether ye have provided iron or no I knowe not but I trust by this berer to know at his returne, thus I beseche y^e lyvynge god alweyes to rule in yo^r harte and governe yo^r mynd at burley in hast by yors to his poore power ye xiij of June 1556.

ABRAHAM.

[Addressed] To the ryght worshipfull Sir Wilłm Cicell knyght geve thes with spede.
[Endorsed] 1556. 13 Junij Abraham.

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xx. No. 8.

at burlegh the 18. of octob. 1561.

My dewtie to yo^r $hono^r$ most umblye consydred I have sent ẏo herin a tryck of the brewhowse as I thynck it wold do well, & where I make ij Rowmes for the bakehowse & mylne, ẏo may have more howses of the same Rowme for to make yo^r corne chambers of, for yo^r workes the quarye in the garden gothe on as faste as may be the Range wall to the Courte is up to the flore the cornar stones of the turret y^t maketh the square is layde, the east syde wall is at the Walke in the gutter & the lead layd therof, the Cundet howse the Ruffe is set heygher but I have medled no further w^t it for y^t I wold take the advic of the plomer w^c is not yet come, but when he cometh yo^r adic̃ [? advic̃] therin, ẏo shalbe answered, the east wall of the terras in the garden is so heyh as the quarter y^t is made of the garden. I have clensyd the hedge ronde abowte the orchard the prest wyll not open the grownd in dyvers places of the orchard, for y^t he saythe the holes wyll stand full of water do what he can, the be walnot set a good sort the hall is halfe selyd w^t plaster over the head w^c shewthe vere fayre, I thynck it good to lay the flore over the pantre somwhat hegher than the flore of my ladyes chamber, for when yo shall inlaye the lytle parlar as yo must nedes then of nesessitie yo must reyse y^t flore I pray yo let me know yo^r plesur herin shortlye becawse it is in hande precēlye [presently] the name of the mason I wryt to yo of is Thomas Hatcher dwell at ruskome iij myles frome Reyding. he promest me he wold serve yo w^towt fayle, there is some store of aslar hewen these Rayne days, the hangings y^t were wryten fore, peter canot carye them up now onles he shold lay them apon the stoud horses, but it were better y^t I shold bryng them when I come w^c shall be abowte martēmas god wylling. I truste yo^r $hono^r$ wyl be my good Master for the leas of the farme of Coltneyt the quenes Rentes shal be payd acording to yo^r Comādment god wylling who preserve yo^r $hona^r$ in all prosperitie bothe of bodie & soule amen.

by yo^r umble servant

PETER KEMP.

my L. of Rutland was at burlegh of Wedynsday laste. the ayre of Hargraves axe thane ijc markes save fyve for his entrest of the lands in Stamford.

[Addressed] To the Ryght hon^rable and my syngular good M^r Sir W^m Cecill knyght pryncepall secretorie to the quenes ma^{ty} geve this w^t sped.
[Endorsed] 18 Octob. 1561. Peter Kemp.

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xx. No. 19.

at burlegh the 3. of Novēb. 1561.

My dewtie to yo^r $hona^r$ moost umble consydred I have recyved yo^r letters of the 21. & 23. of october, for yo^r brewhowse & the other howses there standing must nedes Rawnge as apearethe by the platt but not so narow in the west end as the platt shewthe they wyll not stand so in syght y^t skyll for y^t, for the water I wyll undertake y^t the stable shall not corrupt it, I wyll turne it so frome the course y^t it hethe now, the quarry in the garden is at the dore y^t leadethe thorow by the parlar dore into the gardyn, for the water in the condit howse when the plom̃er is come my advic is, y^t the pipe y^t comethe from the head, shall rune up by a poste tyll it come to the toppe of the howse, & there returne downe apon the mydest of the table into a basen acording to a tryck I heve made to shew ẏo the manner therof it is not vary syghtlye for y^t I ame not coning in drawing, the hangings shal be sent up as shortlye as I can possyble, it was not my dede they came not, but other carege, I have begune the quicke setting of the grownd, and mean to lett the reste by great I do not prosed after the tryck I

sent ŷo for y^{t} I se I shall lose the vantage of the bancke yf it shold not ryse betwext the hedges becawse on the top I wyll sette a dead hedge, y^{t} ŷo shall precentlye put in yo^{r} dear, & y^{t} dead hedge shal be a fenc for ix or x yers, & the heyght frome the playne gronde to the toppe of the dead hedge s ix fote, holye wyll not be strong Inough for a hedge of it selfe, but I have determyned so farr as I cane get holye Inogh, to make ij Rawes of thorne and the therd of holye, w^{c} shal be on the insyde of the walke, and to be above all the Rent of the hedge, yf it shold be on the owte syde to the close y^{t} the dear myght com to it it wole as I thynck rather occasyon the dear to be bese [busy] w^{t} it to the hurt of all the hedge, but it apering above all the hedge ever opene wyll do fayre Inough I fear I shall not spare ŷo anye some of money to the purpas for yf I do I muste borow agayne, my M^{rs} yo^{r} mother wyll take her Jorney towards ŷo the x. or xi. daye of this monethe so sone as I may speke w^{t} thomas burtū and lowyck I shall sertifye ŷo what fowle ŷo shall truste to, I have not further to trobe ŷo w^{t} at this tyme but the lyving god be yo^{r} defender amen.

by yo^{r} umble servant
PETER KEMP.

[Addressed] To the Ryght hon^{r}able and my syngular good M^{r} Sir W^{m} Cecill knyght prencipall secretory to the quenes ma^{ty} geve this w^{t} sped.
[Endorsed] 3 Nov 1561 Peter Kemp to my m^{r}

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xx. No. 46.

The Surveyo^{rs} byll.

Delivered To John Mounte for ye use of M^{r} Secretorie Cecilles The parcells followinge
Imprimis for xliij^{ml} of bricke at vij^{s} the m^{l} delivered at y^{e} kill—xv^{li} xij^{d} for ij loade đi. of Lath at xviij^{s} ye loade—xlv^{s} for xvij loade of timber at xj^{s} ye loade—ix^{li} vij^{s} for v^{c} of q^{r}tirbourd at iij^{s} viij^{d} ye C.—xviij^{s} iiij^{d} for v^{ml} vij^{c} of plaunchbourd at iiij^{s} ye C.—xj^{li} viij^{s} for xxxviij loade of Tallwood at iij^{s} viij^{d} y^{e} load—vj^{li} xviij^{s} iiij^{d} for iiij bushells of whiet plaister at xviij^{d} ye bushell—vj^{s}— } xlvj^{li} iij^{s} viij^{d}
[dorso] Leade delyvered to the Sergeaunt plōmer as followeth
Inprimis the xth dai of marche 1560 fyve hundrethe đi xxxv^{li} of leade
Item moore delyvered the same dai fyve hundrethe fyve & twenty pounde of Lead.

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xxiii. No. 10.

. . . . I dyd mak the 3 & 5 d . . . . y & sent them by p . . . . is an other fawte w^{c} we do thynck meete to be amendyd y^{t} is the grownd table wold be suncke downe lower by 2 fote di. or els yo^{r} open galary wyll doe ŷo lytle plesuer for at the present ŷo can skase standing wthin loke into the garden over the soyle of the bay wyndow it may be wyll suffred to syncke where the frese co^{r}nishe & arcatrave dothe & no fowle syght but rather a bewte M^{r} Cave is at Stamford at this precent, my m^{rs} yo^{r} mother is mere [merry] god be thanked. I have not further to troble ŷo w^{t} but o^{r} blessyd Lorde presarve ŷo in helthe & hona^{r} amen.

by yo^{r} umble servant
PETER KEMPE.

[Endorsed] 8 May 1562.
Peter Kempe.

[Addressed] To the Ryght hon^{r}able and my syngular good M^{r} Sir W^{m} Cecill, &c.

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xxiii. No. 19.

at burlegh the 16. of Maye 1562.

My dewtie to yo^{r} hona^{r} moste umble consydred I have receyved yo^{r} letter frome M^{r} Wyngfyld w^{t} the indentur & a cote clothe I know not for whome, yo^{r} masons sence they came have ben yet hetherto onestlye occupied in making reyde of suche stone as is nedfull furste to be ocupied I have sent ŷo herin

a note of the mesner of Wortherp the thyng is noysed abrode in the contrey alreyde & sutors for it to have some promesse of the farmes I thyncke yf ŷo wyll there wyl be as muche money geven as wyll bulde the fore farmes mare I fear ŷo must lose some of the Rent ŷo now receive for it for the ꝑsonage of Leffnam I have hadd talke w^{t} a lerned man who is Chansler to my lorde of Peterborow he is bothe sober wyse well lerned & hathe a goodlye trade in teching & delygent therin his name is m^{r} antonye . . . . awse it is neygh my lorde he wyl be content to be bonde to dwell upon it & if it plese ŷo to admyt hym he is a man may do muche good in the contrey w^{t} his preching I have told hym y^{t} ŷo wold be content to bestow it of suche a man condyssyonely y^{t} he shold d . . . . it we have not the lyke man in all o^{r} contrey saving my L. bysshop. for the falling of the grond table it is not ment otherwyse then those too plases where the pillers do stand the bay wyndow to be as it is w^{c} is 4 fote to the leyning plac the Rugh mason are makyng of a hoggs cote where apon the water w^{c} rones apon the est syde therof I do set a howse of offece w^{t} an entre y^{t} shall come in betwext the hoggs cote & the slaughterhowse. I have not further to troble ŷo w^{t} at this precent but holygoste preserve ŷo in helthe & hono^{r} & sende ŷo sone into the Contry amen.

by yo^{r} umble servant

PETER KEMPE.

[Addressed] To the Ryght hono^{r}ble and my syngular good M^{r} Sir W^{m} Cecill.

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xxvii. No. 11.

at burlegh y^{e} 10. of Januarye 1562.

My dewtie to yo^{r} hono^{r} moost umblye consydred I sent ŷo an answar to M^{r} Conyers letter by y^{e} post aboute new yeres even. for those Rentes ŷo wryte for for stamford I did not understand that ŷo payd y^{e} quenes ma^{ty} a Rent forth of it yf I hadd it shold not have benn unpayd but hence furthe I shall see it payd to the Receyvors for other Rentes, bothe Cayworthe and y^{e} bayliffe of Cesterton have sent up with this berar Peter. for y^{e} strangers so farr as I do parsayve by them they lyk the towne & y^{e} frear howse well inough I have spoken w^{t} the alderman & some of the bretherne to lerne there good wylls therin, but what answar I shall have as yet I knowe not by y^{e} next ŷo shall understand, ŷo were not best loke for anye great sume of money by them to be lent more then the Comen Stocke which is not above iij^{xx} x^{li} ŷo must devyce other orders amongst them then are yet anye ther or yo^{r} labor shalbe loste and the strangers shall do no comoditie to the towne nor them selfes. I wryt to know yo^{r} plesure whether ŷo wold y^{e} ij quarters on y^{e} est side of y^{e} garden shall be layd levell with y^{e} west syde or no y^{e} charges wylbe great & it wold do fayre inogh yf they lye as they dow. my m^{rs} yo^{r} mother is mere [merry] god be thanckyd I have not further to troble ŷo with but y^{e} holy gost be yo^{r} governor. for y^{e} Rent of barodon y^{e} baylyffe hathe at this precent delyverd it to peter lykwyse. yo^{r} workmen y^{t} be this day at burlegh be one fremason y^{t} was hyred by y^{e} yere working apon ye ij wyndowes in y^{e} insyde ot y^{e} Courte also Combrell & his boy w^{ch} be laying a gutter for y^{e} water to ronne downe y^{e} myds of y^{e} garden for y^{e} watring thereof therbe also xvij labrars whereof ij be thresshers & ij do plant & set & xiij be working in y^{e} garden which is a sore work. I must have one or ij other to Reyse freston.

yo^{r} umble servant

PETER KEMP.

I loke for answar frome ŷo whether ŷo have spoken to my L. of Hunton for Sir Thomas nevell his nettes.

[Addressed] To y^{e} Ryght hon^{r}able and my syngular good M^{r} Sir W^{m} Cecill.
[Endorsed] x^{o} January 1562. Peter Kemp.

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. xxxiv. No. 51.

It may please youe to vnderstande that accordinge to yo^{r} requeste I have bene at Burley and have conferred wth Kempe & Norris accordinge to yor pleasure to me declared: I assure youe I take yor determinacon for the staires to alter into the Chappell shall do verie well, w^{ch} alter will not be past ij foote di. in the nether ende of the Chappell, by occasion whereof I doubte not but youe will like the

proportion of yor chamber much the better, to passe cleane thorough to the maine wall of the hall, and a Portall to rise before the dore : To leave a half pase betwene the hall and the Chamber of iij^or^ foote di. it wolde be to litle purpose, and yet it wolde be a great blemishe to yor chamber to take so much in length. ffor thoughe the portall risinge in the midest of yo^r^ chamber, takinge at the least iij^or^ foote d^i^ yet notw^th^standinge it will bewtifie yor chamber beinge well wrought and the romes on both the sides will serve for good purposes. But if the Portall might be placed in the side corner of the Chamber, it wold stande much more apter then in the midest: on the East side of yor chamber it can not stande, because the dore wold spoile the side of the hall, where the longe borde shoulde stande, and on the West side of it, it will take half the windowe in the chamber, w^ch^ may be borne, but the dore standinge against the end of the high table in the hall, will pester yor dore, except youe do apoint the shorter table to serve that place. Youe may consider of it as to youe shall seme best, and so to be followed accordingly, youe shall finde that the breadth of the Chamber will beare the whole length very well. And accordinge to yor minde Kempe will provide as many Masons as he canne gett, so as the south side of yor house may be perfected before winter, w^ch^ is a great pece of worke to cutte out of yor harde stone so shortlie. I have advised Kempe to make a profe of v foote square, what the chardges wilbe, to take y^e^ grounde out of yor garden to the loones [lowness] of the flower in yor lower gallerie, so as you may have an estimate of the rest for that yor tarresses be alredie set forth and the stoone work of a great part of them done thei will take litle more earth then alreadie is bestowed of them. But for y^e^ bestow-inge of yor earth, if it shall seme to youe so good, I thincke the angell of yor orcharde, w^ch^ lieth of the west side of yor garden, & on the south side of yor base courte, w^ch^ grownde hath a great dessent, w^ch^ dessent beginneth about xxx^te^ foote from the wall of the base courte, to the end of the wall of the garden. My mind is for to spend the earth that shall come out of yor garden, I wolde have a wall to goe from the rounde mounte of the south west corner of yor garden. Westwarde to the water, to be even with the height of the grounde adjoyninge upon the wall of yor base courte and so to make all that Angell levell, to use as to youe shall seme good. And if the earth that cometh out of the garden will not suffise to make the lower parte equall to the higher, as it is at this present the higher parte maye be cast downe to the lower w^ch^ is no great chardge. and so it will awnswere the better w^th^ the flower of yor garden. Thus beinge bolde to write to youe my minde w^ch^ as I thinke shal be as well a beutifying to yor orcharde to geve it an even head before yor house, as to the beutifying of the growndes, next adjoyninge to the principall side of yor house to be even and levell, howesoever it shall please youe to use it. ffurther herein at this tyme I have not to say: but from tyme to tyme as occasion shall serve, I shal be glad to do my dever to the uttermost of my power to do youe & yors any pleasure or service I shal be able. [Then follows other matter not relating to the building.]

Written from Greatforde the xxx^th^ day of August 1564.

Yours to cōmaund

EDMUND HALL.

[Addressed] To the honourable Sir Wilł̃m Cecill Knyghte.
[Endorsed] 30 Aug 1564. Mr Edmund Hall to my M^r^

"STATE PAPERS, DOMESTIC," ELIZABETH, Vol. cxxv. No. 40.

My duetie moost humbly remembred. It maie please yor L. to knowe that the wekely paie of all sortes of woorkmen nowe at Burghley cometh to xj^ti^ and thereabouts, and there be no moe in woorke then of necessitie must nedes be to performe those works yor L. did appointe, and yet as the same ende I doe discharge the superflouous nombre. And I hope I shall have money of yor L. owne to discharge all works now appointed betwene this and Mich̃s.

The Mason woorke at the Conduyte house is done, and the plommer is in hande therew^th^.

The ffret of the gallerye very neare the half therof is also done and the floore of the north ende is also shotte. The plaster woorke is also doone every where unto the gallery floore. And all the woorkes of the new buildinges, except it be trifles of a masons works in settinge up certen cuppes of the vamure, are also brought doune.

The masons be in hande w^th^ the crosse wall from the Sowth tower to the rounde there, and the dore in that wall is almoost sett up w^ch^ was made of the one half of the litle gate that stoode

upon the Terrasse before the olde buyldinges, And the other side of y^{t} gate is reserved for the like dore to be made at the north ende of the terrasse before the house I have sent for xl^{ti} lodes more plaster. [Then follows other matter not relating to the building.]

At Staunforde the xxxth of Julye 1578.

Yor L. moost obedient servaunte

RICH : SHUTE.

[Addressed] To the right Honorable his singuler good L. and M^{r} the L. Burghley L. highe Threr of Englande and one of the Lorde of her M^{te} privy Councell.

[Endorsed] 30. Jul. 1578. Richard Shute.

A SIXTEENTH CENTURY ACCOUNT.*

[From the Bodleian Library, MSS. Rawlinson, 340 B.]

Anno K. H. viij xxxiiij^{to}.

ROCHESTER.

PAYMENTS made and paide by my mast' James Nedam clarke and surveo^{r} gen'all of o^{r} sov'aigne lorde the kings works aswell upon wages not onely to artiffy'iers labrs clarke and other workinge upon certyn works by o^{r} sov'aigne lorde the kings comanndemet to be done at his graces said manno^{r} of Rochest' but also upon empcions of stuf bought requysyte and nec'ys for the same works carr' and Recarr' aswell by water as by lande as by the ptyculer payment thereof more at largge it dothe apere that ys to saye from the sondaye the xxij daie of October inclusive unto the sondaye the xix daie of Novembr exclusive by the space of a monthe.

Fremasons — Workynge not onely in hewinge bothe of inwarde and outwarde coynes for wyndows in the greate halpas and in the pages chambr and note onely thus workinge but also hewinge of james for the chymneys in the same chamb' w' a matell for the same chymney of freestone v fote wyde w^{t} other sondry things requysyte in the said works.

	John ssteele	xxiij daies	xv^{s} iiij^{d}
At viij^{d}	William Kerbye	xvij daies	xj^{s} iiij^{d}
	ffrannces Langfelde	xxiij daies	xv^{s} iiij^{d}

Carpenters — Workynge not onely in framynge and raysinge of a galary over the cloyst' from the great halpas into the kyngs great chamb but also framynge and raysing of a floore in the pages chamb and inlyke manno^{r} framyng and settinge upe of ij dores steds one at the inbrynge into the said galary the other goinge into the kings great chamb more ov' quart'inge geyftinge fenyshinge of the lytell galary betwene the olde lodginge and the newe and not thus only workinge but also rebaytinge moldinge and inbowinge as well for Jawe pecs as for clerestores and baye wyndows to be ymployede within the said works wythe other dyv'st and sondry works by

At x^{d}	Thomas Jaklyn	xxiij daies	xix^{s} ij^{d}
At viij^{d}	John Barrengg	xxiij daies	xv^{s} iiij^{d}
	Thomas ffrenche	xxiij daies	xv^{s} iiij^{d}
	Roger Bradley	xxiij daies	xv^{s} iiij^{d}
	Thomas Clifforde	xxiij daies	xv^{s} iiij^{d}
	John Newyngton	xxij daies	xiiij^{s} viij^{d}
	George Chylde	xxij daies	xiiij^{s} viij^{d}
	Robt. Hardwen	xxiij daies	xv^{s} iiij^{d}
	Edwarde Broock	xxiij daies	xv^{s} iiij^{d}

* Catalogued thus: "Paybooks of James Nedham, Clerk and Surveyor-General of Works of Henry VIII. "for masons' and carpenters' work, &c, done at the King's Manor of Rochester, in the two months from

At vij^d	John Rowe	xxiij daies	xiij^s	v^d
At vj^d	Edmonde ffreman	xxij daies	xj^s	
	Gabryell Gybbons	xxiij daies	xj^s	vj^d
	William Wade	xxiij daies	xj^s	vj^d
	John Berrengg	xxiij daies	xj^s	vj^d
	Robt. Butler	xxij daies	xj^s	
At v^d	Robt. Jakelyn	xxij daies	ix^s	ij^d
At iiij^d	Anthony Jakeson	vj daies	ij^s	

Sawyers

Workinge not onely in sawinge and cuttinge of tymber for the foresaide galary on the cloyster butt also cuttinge of tymber for jawe peces and square tymbr for the floore in the pages chamber more over cuttinge of somers doble geysts celynge geystes and lynstalls for wyndows and dores and further more cuttinge of elme plankes for crockes.

At xiij^d (*the pair*)	Richard Lynnolde, Wyllyam Averye	xxiij daies	xxiiij^s	xj^d
	Peter Swanton, Barnard Hamonde	xxiij daies	xxiiij^s	xj^d
	John Bett, John Wheler	xxiij daies	xxiiij^s	xj^d
	John Stuter, William Gryggs	xxij daies*	xxij^s	ix^d
	Roger Godhelpe, John Garlande	xxiij daies	xxiiij^s	xj^d

Brckelayers

Workinge not onely in fenysshinge and makinge and ende of the batelments over the greate halpas but also bryngynge upĕ of the walls with the foundacōns takinge owte of the grounde for the pages chamb ij stores hygh more over forsinge upĕ of wyndows dore stedes and other dyverse and sondry things with the saide works by them done aswell in the galary on the Cloysters as

At x^d	Henry Dannsye	xxiij daies	xix^s	ij^d
At viij^d	John Garratt	xx daies	xiij^s	iiij^d
	Rauf Newton	xxiij daies	xv^s	iiij^d
	William damporte	xxiij daies	xv^s	iiij^d
	Robt. Stringg	xxij daies	xiiij^s	viij^d
	Rychard Rusell	xxij daies	xiiij^s	viij^d
At vij^d	William Champenes	xxij daies	xij^s	x^d
At vj^d	John Chyrche	xxj daies	x^s	vj^d
	Rychard Younge	xxj daies	x^s	vj^d
	John Goodderyche	xxj daies	x^s	vj^d
At v^d	Robt. fferrer	xx daies	viij^s	iiij^d
	Thomas hudson	xx daies	viij^s	iiij^d

Plomers

Workynge not onely in meltinge and castinge of the olde leed into shetts for the lytell galary betwene the olde lodgging and the newe aswell as for the halpas as the fflatte roof on the Cloyst and also on sondrye clerestores and bay wyndows with lyke carr^d wyndinge upĕ to the rooff layenge the saide leede.

At viij^d	William huggens	x daies	vj^s	viij^d
At vj^d	John lancaster	xxj daies	x^s	vj^d
At vij^d	ffrannc's Kyrbye	xxiij daies	xiij^s	v^d

"22 Oct. to 24 Dec. 1542 with portions of two other similar books, ff. 1. 15." The account printed above consists of one (the first) month's sheets.

* This is 22 days in the MSS., but from the amount should be only 21.

Scaffolders

Workinge in making of skaffolds and staggs for the workemen to stande and work upon w^{t} lyke takings downe removing and settinge upẽ the same agayne with other sondry things therto belongynge.

At vj^{d}	John Creme	xxij daies	xj^{s}

Mort' makers

Laboringe aswell in beringe of wat' as in slackinge of lyme with lyke betinge and workig the same lyme with sand to morter with other labor.

At iiij^{d}	John Claver	xxv daies	viij^{s} iiij^{d}
	Rauff burton	xxv daies	viij^{s} iiij^{d}
	John baker	xxv daies	viij^{s} iiij^{d}
	Thomas baseley	xxv daies	viij^{s} iiij^{d}

Labrs to the Brecklayers

Laborynge aswell in beringe of mort' as brecke stone and other fyllinge stouf withe lyke brekinge downe of the walls where the cleresto's and baye wyndows are newe forsed upe with other sondrye labor by them done.

At iiij^{d}	Anthony Hudson	xxiij daies	vij^{s} viij^{d}
	John Mylbrone	xxiij daies	vij^{s} viij^{d}
	Wat' Kydwellye	xxiij daies	vij^{s} viij^{d}
	Arnolde haparto	xxiij daies	vij^{s} viij^{d}
	Henry Smyth	xxiij daies	vij^{s} viij^{d}
	John Danye	xxiij daies	vij^{s} viij^{d}
	Rychard m'shall	xxiij daies	vij^{s} viij^{d}
	John Johnson	xxiij daies	vij^{s} viij^{d}
	Xρoffer Robson	xxiij daies	vij^{s} viij^{d}
	Robt Rounde	xxiij daies	vij^{s} viij^{d}
	Pet Bradshef	xxiij daies	vij^{s} viij^{d}
	John Bannester	xxiij daies	vij^{s} viij^{d}
	Thomas Corn	xxiij daies	vij^{s} viij^{d}
	Ric upRichard	xxiij daies	vij^{s} viij^{d}
	John Thomas	xij daies	iiij^{s}
	William Rabye	xxiij daies	vij^{s} viij^{d}
	Robt Wyne	xxiij daies	vij^{s} viij^{d}
	Davy ffIude	xxiij daies	vij^{s} viij^{d}
	Edward Apendelton	xxiij daies	vij^{s} viij^{d}
	Thomas hylls	xxiij daies	vij^{s} viij^{d}

Labrs to the Carpenters

Laboringe in carryenge of tymb with the Tymb carte from the yarde where it was framede into the cloyst as well for the galary as other roofe wyndinge upẽ the same with the gyñes withe lyke carr' of leede hoysinge upe the same leede to the Rooffe ridge for the plommers to laye yt withe other sondry labor by them done.

At iiij^{d}	John Phylype	xxiij daies	vij^{s} viij^{d}
	Robt Smale	xxiij daies	vij^{s} viij^{d}
	Donstone Holewey	xxiij daies	vij^{s} viij^{d}
	ffrancs grombolde	xxiij daies	vij^{s} viij^{d}
	Mozes Joynes	xxiij daies	vij^{s} viij^{d}
	Thomas Apowell	xxiij daies	vij^{s} viij^{d}
	William Shotleye	xxiij daies	vij^{s} viij^{d}
	William Kendall	xxiij daies	vij^{s} viij^{d}
	Stephen boron	xxiij daies	vij^{s} viij^{d}
	William Reede	xxiij daies	vij^{s} viij^{d}
	Thomas Smyth	xxiij daies	vij^{s} viij^{d}
	William Holmes	xxiij daies	vij^{s} viij^{d}
	William Joynes	xx daies	vj^{s} viij^{d}

Comyn labrs	Laboringe aswell in dyginge of foundacons as in carringe owte of rubbyshe leave linge of the vayes with sondry other labor by them done.		
At iij^d	William Knyght	xxiij daies	vij^s viij^d
	Thomas holmer	xxiij daies	vij^s viij^d
	Robt Bannce	xxiij daies	vij^s viij^d
	John Udston	xxiij daies	vij^s viij^d
	Symonde Johnson	xxiij daies	vij^s viij^d
	Stephen Younge	xxiij daies	vij^s viij^d
	John Croosbye	xxiij daies	vij^s viij^d
	William Cowley	xxiij daies	vij^s viij^d
	The Keper of the Storehouse.		
At v^d	Robt Clooder	xxiiij daies	x^s
	The Puveo^r.		
At viij^d	Thomas Wells	xxiiij daies	xvj^s
	The Clarke.		
At vj^d	Rycharde Shelton	xxviij daies	xiiij^s

Empcyons.

Oken tymbr	To master deane of the College of Rochester for iij tonne di' xij fote (? *lengths*) oken tymb of hym had and bowghte for the kinges use to be ymployede withe in the saide workes at v^s iiij^d the tonne with the carr'	xviij^s viij^d
byllets	To Nycholas hylls of Chatam for di'cn^t byllets of hym had occupyede and spente in the plommery at ij^s ij^d the di' cn^t w^t carr'	ij^s ij^d
Wat' carr' of a stone dore	To John Gaytes of maydystonde for wat' carr' of a stone dore for the kings great halpas from london to Rochester weinge iiij tonne at xvj^d the tonne	v^s iiij^d
Wat' carr' of sand	To Stephen Stock of ffrynsbury for Wat' carr' xlj loods of sand from Wikham to the keye at Rochester to be ymployede in the saide works at iij^d the loode	x^s iij^d
Talwoode	To Edwarde ffynn of Strowde for ij loods of talwood of hym had for the plommery at xviij^d the loode withe the carr'	iij^s
daie carr of sand and stone	To Robt Monde of the temple for v dais carr of sande and stone dore from the wat' syde to the kings said manno^r with one courte at xvj^d the daie	vj^s viij^d
daie carr' of sande	To John ffelde of Sainte Margarets for lyke carr' of sande by the space of one daie at xvj^d the daie	xvj^d
lande carr of Lome	To John pollye of Sainte Margarets for dyginge and carr' of the iij loods of lome of hym hade for the ffynn to make his fvrnes at iij^d the lood	ix^d
pap^r	To matres warnar of Rochester for ij quyer of paper of her had to make the kings books at ij^d ob the quare	v^d
Candells	To her more for ij^b of Candells of her had and occupyed by the plommers	iij^d
packthred	To her yet more for iiij bothomes of packe threde for the brecklayers at ob the pete	ij^d
nayles	To John Sturgyn of london Ironmong' for these sorthes of nayles of hym had to be ymployed in the said works as foloweth by the partyculers hereafter.	

	Firste to hym for iiij m^l doble x^d naile at viij^s iiij^d the m^l . .	xxxiij^s iiij^d
	Itm to hym for ij m^l single x^d naile at iiij^s ij^d the m^l . . .	viij^s iiij^d
nayles . .	Itm to hym for v m^l vj^d nayle at ij^s vj^d the m^l . . .	xij^s vj^d
	Itm to hym for iiij m^l iiij^d naile at xx^d the m^l	vj^s viij^d
	Itm to hym for ij m^l ij^d nale at j^d the m^l	ij^d
baste ropes .	To the said John Sturgyn more for the iiij great baste ropes at vj^d apece	ij^s
payles . .	To John parkens of London tourn for one dosyn of payles at ij^d ob a pece	ij^s
Shovels . .	To hym mor for di' dosyn of shovels at iiij^d a pece . . .	ij^s
spades . .	To hym yet more for di' dosyn spades of hym lykeweyse had for the kings use at vj^d a pece	iij^s

Sum totalie of thy'c paye liiij lr iij^s vij^d.

*** The Discussion [see verbatim report in the *R.I.B.A. Journal*, Vol. vi., pp. 156–160] of Mr. Gotch's Paper was opened by Mr. Wyatt Papworth, and continued by Mr. Ralph Nevill, F.S.A., Mr. E. G. Bruton, Mr. S. Flint Clarkson, Mr. J. M. Brydon, and Mr. Paul Waterhouse, M.A. A brief abstract of their remarks and of the reply made by the author of the Paper is here appended :—

Mr. WYATT PAPWORTH, *Member of Council*, considered a great many of the Northamptonshire buildings were designed and carried out by the local masons; the county had good stone, and the masons had been people who had inherited taste and knowledge of how to work their material; while the old family of Grumbold or Grumball, which had done a good deal of work for the colleges at Cambridge, traced back from Raunds in Northamptonshire. As to how the Italian work came into England, he considered was still unknown, and that point Mr. Gotch scarcely touched upon. John Shute had been sent into Italy in 1550 by the Duke of Northumberland, but no single building of his was known, although his epitaph referred to many. He had discovered a few records of John Thorpe in connection with Crown lands as a surveyor, but there was no record in county histories connecting his name with buildings. In the register of burials at St. Martin's-in-the-Fields he had found three Thorpes, and then in 1618 there was a burial of "John Thropes." It was a question whether that was John Thorpe. But in a work called the *Northampton and Rutland Wills*, 1510–1652, various Thorpes were mentioned, while in 1560–66 appeared "Anne Thrope" of Oakham; which almost confirmed the suspicion that Thorpe and Thrope were the same name. The word "trick" was the old heraldic expression used in regard of a coat-of-arms drawn, not coloured; while the term "plat" was equivalent to plan.

Mr. RALPH NEVILL, F.S.A., *Fellow*, thought that the woodwork and interior fittings, where they survived, were, from an architect's point of view, more interesting than the outside of the houses described by Mr. Gotch. He had come to the conclusion that the origin of the style was in the time of Henry VIII., who was a most extravagant builder, especially in the South of England. In the Bodleian Library was a record* of the account of Nedham, a Surveyor-General of the Works to that King; this Professor Thorold Rogers had used in his *History of Agriculture and Prices in England, A.D.* 1259–1793, and stated that the joiners had mostly Italian or French names: which conclusively

* In the "Rawlinson MSS." One of these accounts is printed at page 109; and it will be seen from an examination of the workmen's names that they are undoubtedly English. Other accounts in the same MSS. have been looked through by Mr. Drinkwater, of Oxford, and he has not found any confirmation of Professor Thorold Rogers's statement, which was (vol. iv. p. 510) that the joiners were "almost invariably foreigners."

proved they had been brought over at that time and brought the style with them. This new style came in the greatest perfection, not in rude, tentative efforts. He thought mullions survived to a later date in stone counties than Mr. Gotch had stated: in Gloucestershire they were to be seen well into the eighteenth century. The workman appeared to him to have been considerably in advance of the general designer, until at a later date architects went to Italy and studied the style first-hand.

Mr. E. G. BRUTON, F.S.A., *Fellow*, said the illustrations exhibited were familiar to him from the resemblance to Oxford work, in which a great deal of the feeling which was so fine in Northamptonshire would be found.

Mr. S. FLINT CLARKSON, *Fellow*, referring to the Triangular Lodge at Rushton, said the chimney-stack in the centre of the building was over the middle of the hexagonal room on the upper story, and the method by which the chimney was carried was one of the unsolved puzzles in that unique building. He believed the book of Thorpe's drawings was a collection of drawings from Thorpe's office bound together to form a volume, and considered they were preliminary sketches made by persons connected with the detailed execution of the buildings.

Mr. J. M. BRYDON, *Fellow*, was inclined to call the period under discussion the dawn of the Renaissance rather than the Renaissance itself, and had little doubt that such buildings as Lyveden were designed, not entirely by natives, but had been influenced by the spread of letters, which found its way to England and brought the art with it. The plaster-work he considered very fine, and some was of a richness it had never since attained. Burford Priory, Oxfordshire, was almost identical with some of the work exhibited by Mr. Gotch; and the private chapel, an addition at a later date, was one of the finest pieces of Renaissance to be seen.

Mr. PAUL WATERHOUSE, M.A., *Associate*, referred to the side light thrown upon the early days of the English Renaissance by contemporary paintings, instancing the well-known picture "The Field of the Cloth of Gold," and another, a group of Henry VIII. and his family, both the reputed work of Englishmen, and containing specimens of Renaissance architecture.

Mr. J. ALFRED GOTCH, *Fellow*, explained the difficulty there was of getting adequate photographs of interiors, stating also that in many of the houses nothing remained to photograph. The Renaissance work in Oxford did not seem to him so good and interesting, nor so suggestive, as that in Northamptonshire, although there was a family likeness. One suggestion concerning John Thorpe was that he had been simply employed as a surveyor to measure the buildings for their owners, and it was recorded that he had surveyed Holdenby for the Crown, so that the ground plan in his book might be the plan he made as surveyor. Still, Mr. Gotch considered some of the plans must be Thorpe's own designs, and that in them could be seen the work of the designer as it was passing through his mind.

LXIX.

BUILDING LEGISLATION.

By John Slater, B.A. Lond., *Member of Council.*

Mr. Arthur Cates, *Vice-President*, in the Chair.

Mr. Vice-President and Gentlemen,—

IT would be difficult to find any matter of greater practical interest to the whole community, more particularly to that portion of it which is compelled to reside in any large town or city, than the laws regulating the erection of buildings. From the millionaire in his palace to the labourer in his hovel, all classes of society require some shelter from the elements, somewhere to live, some place that can be called home. And however mean may be the dwelling, the inmates have a right to expect that, if they pay rent for it, it shall be constructed in such a way that they may live in it decently and under fairly good sanitary conditions. The subject is increasing in importance daily. All our great cities are getting larger and more populous year by year, while this huge wen of London is increasing at a rate that absolutely defies calculation. Recent statistics show that the country districts are becoming more sparsely populated than ever, and that the inhabitants are being gradually sucked into the great vortex of city life. This tendency must have a most important bearing upon public health, and all medical men are agreed that the larger the area of cities becomes, and the more closely packed the individual houses, the more need there is for stringent regulations as to the erection of these houses. In order to give you some sort of notion of the way in which London—I mean Greater London, or, as it may now be called, the County of London—has lately increased, the following statistics may prove interesting. At the beginning of this century the population was 958,863, occupying 136,196 houses. In 1811 the population was 1,138,815; in 1821, 1,378,947; in 1831, 1,654,994; and in 1841, 1,948,417; i.e. just about a million inhabitants were added to the population in forty years, or an average of 250,000 per decade. In 1851, the date of the last census before the passing of what we all know as the Metropolitan Building Act, the population was 2,363,495, showing an increase for

the decade of 414,000 ; the number of houses was 306,086. In 1871 the population was 3,254,260, and the number of houses had increased to 419,642 ; and in 1881 the population was 3,814,571, showing an increase of 560,000 in the decade, and the houses 488,995. In 1889 the number of houses is estimated at 549,283. Thus during the last eighteen years houses have been built at the rate of 7,200 per annum. Moreover, it must be borne in mind that if I could give you the statistics of those parts of London where the growth has been most rapid, the figures would be much more startling, because in the City and many parts of Westminster there has actually been a reduction in the number of houses. To take one parish, St. Mary Abbot's, Kensington: in the twenty years from 1851 to 1871 close upon 10,000 houses were built, and if I had the numbers now, you would find that the recent increase has been quite as rapid. In the outer ring just beyond the County of London, the increase has been more remarkable, as the Registrar-General states that its population doubled itself one and a quarter times between 1861 and 1881. Nor is this rapid increase confined to London. In the manufacturing districts of Lancashire and Yorkshire the increase has been almost as great. With these facts before us, can there be two opinions as to the interest which the masses ought to take in the laws regulating this enormous amount of building? And I would further ask, can there be two opinions as to the apathy with which—speaking generally—the subject is regarded by the public at large?

If those who have to dwell in these houses are concerned in knowing that proper control is exercised over their construction, much more are those who are responsible for the way in which they are erected—the builders who construct them, the architects who design them, and the officers who are entrusted with carrying out the regulations which control them,—much more, I say, are these interested in the nature of the regulations themselves. And this brings me to the question that I am asking you to discuss to-night, which is this: Are the regulations now in force, not only in the metropolis, but also in the majority of our great cities, suitable and sufficient for the necessities of the present day? I shall give you as shortly and concisely as I can the reasons which, to my mind, appear to compel a negative reply to that question. I shall mainly confine my remarks to the metropolitan district, because I cannot help thinking that this great city *ought* to have a Building Act, or Code, or whatever you may like to call it, which should be a model for other towns, instead of being, as I shall be able to show you, far behind one, at any rate, of the chief provincial cities.

Greek law is a subject which has been but scantily treated by classical writers, and we know very little of the building regulations which were in vogue in Athens or the old Greek cities; but there is no doubt that Solon's legislation dealt fully with servitudes and the rights of neighbouring owners. There were officials in Athens called ἀστυνόμοι, who looked after the public and private buildings, and special officers who had the care of walls, springs and wells, and boundaries, τειχοποιοί, κρηνῶν ἐπιμεληταί, λιμένος φύλακες. And in addition to these there were special officials called ὁδοποιοί,

whose duty it was to look after the public roads and private encroachments. I believe it is not known how much of Solon's legislation was embodied in the Twelve Tables.

It is interesting historically to note what were the regulations as to buildings in ancient Rome, as nearly all our laws are developments or modifications of Roman law. For very many years—in fact, down to the second century before Christ—restrictions or servitudes attached only to landed property and not to houses, and comprised rights of conducting water and of drawing water, rights of way, and rights of driving cattle.* After the second Punic war, which finished 202 B.C., the population of Rome increased very rapidly, and building operations were carried on so continuously that it became necessary to lay down laws as to buildings; and from this period date: (1) the institution of the party-wall with its rights and obligations on the owners on each side thereof; (2) regulations as to carrying off rain-water; and (3) rights of light and prospect. In the Eastern Roman Empire, after an extensive conflagration at Byzantium in 469 A.D., Leo I. and his successor Zeno promulgated precise building regulations, which were afterwards added to and codified by Justinian. Both in the Roman and Byzantine regulations are found powers to control the height of buildings.

The earliest regulations for building in the metropolis that I have found any notice of are what were known as Fitz-Aylwin's Assize of Buildings, passed in the first year of Richard I., exactly 700 years ago, and it is very interesting to notice that at this early period the general intention of these regulations was very similar to that of our present Building Act. These institutions were framed first in the hope of checking the fires which were of very frequent occurrence in a city much of which was constructed of wood; and secondly with a view to obviate as far as possible or to decide the quarrels of neighbours whose dwellings adjoined, infringed upon, or overlooked each other. The old French proverb held good then as it does now, "Qui "terre a guerre a."

These regulations are given in the Liber Albus, or White Book, of the City of London, compiled in the year 1419 by John Carpenter, the town clerk during one of the mayoralties of the celebrated Dick Whittington. The following extracts will be interesting: "When it happens that two neighbours wish to build between themselves "a stone wall, each of them ought to give one foot and a half of his land, and so at their "joint cost they shall build a stone wall between them, three feet in thickness and six-"teen feet in height. . . . They may also, if they agree thereupon, raise the said wall "as high as they please, at their joint cost. And if it so happen that one wishes to "raise such wall and the other not, it shall be fully lawful for him who so wishes it, to raise "the part on his own foot and a half as much as he may please, and to build upon his "part without damage to the other, at his own cost. . . . And if any one shall wish to "build of stone, according to the assize, and his neighbour, through poverty, cannot or "perchance will not, then the latter ought to give unto him who so desires to build by the "assize, three feet of his own land, and the other shall make a wall upon that land at his

* *Aquæductus, haustus, iter, actus.*—J. S.

" own cost, three feet thick, sixteen feet in height ; and he who gives the land shall have " one clear half of such wall, and may place his timber upon it, and build."*

The reason for this is thus quaintly given: " It should be remarked that in " ancient times the greater part of the city was built of wood, and the houses were " covered with straw, stubble, and the like. Hence it happened that when a single " house had caught fire, the greater part of the city was destroyed through such con- " flagration—a thing that took place in the first year of the reign of King Stephen, when " by reason of a fire that broke out at London Bridge, the Church of Saint Paul was " burnt, from which spot the conflagration extended, destroying houses and buildings, as " far as the Church of St. Clement Danes. After this many of the citizens, to the best " of their ability, to avoid such a fire, built stone houses upon their foundations, covered " with thick tiles, and so protected against the fury of the flames, whence it has often " been the case that when a fire has broken out in the city, and has destroyed many " buildings, upon reaching such buildings it has been unable to do further mischief, and " has been there extinguished. Hence it is, that in the aforesaid ordinance, called the " assize, it was provided and ordained, in order that the citizens might be encouraged to " build with stone, that everyone who should have a stone wall upon his own land six- " teen feet in height might possess the same as freely and meritoriously as in manner " stated. . . To the end that such house may remain secure and protected against the " violence of fire when it comes, and so through it many a house may be saved and pre- " served unharmed by the violence of the flames." There are many other provisions as to corbels in party-walls, gutters, water-pipes, &c., and the whole document is very interesting.

It would be a tedious task, and would serve no good purpose, to recapitulate the various Acts which were passed under the Plantagenet and Tudor sovereigns ; but very little real control was ever exercised, and all contemporary records go to prove that London before the Great Fire was badly built, irregular, insanitary, and, generally speaking, quite neglected. The Great Fire of London in 1666, which necessitated rebuilding on a scale and with a rapidity which were unprecedented, gave rise to a somewhat comprehensive Building Act, known as the 19 Charles II. cap. 3, followed three years later by an additional Act. These Acts contain the first references to " rated " buildings, i.e., buildings of the first, second, &c., rates and classification, which remained in force until the passing of the 1855 Building Act. In 1707 another Act was passed, primarily with a view to prevent mischief by fire; this Act is known as

* Quando contigit quod duo vicini voluerint hospitare inter se de lapide, quilibet eorum debet prebere pedem et dimidium de terra sua, et sic construent communi custo murum lapideum inter se spissitudine trium pedum et altitudine sexdecim pedum. Stillicidium autem inter se, si voluerint, facient communi custo ad aquam de domibus suis recipiendam et conducendam, sicut melius viderint expedire. Si vero noluerint, potest quilibet eorum per se facere stillicidium ad aquam stillantem de domo sua recipiendam super terram suam propriam, nisi illam possit in vicum regium perducere. . . . Et si aliquis velit de lapide hospitare per assisam, et vicinus ejus paupertate coactus non poterit vel forsitan noluerit, tunc prebere debet per assisam volenti hospitare tres pedes de terra sua, et alter faciet murum super terram illam proprio custo suo spissitudinis trium pedum et altitudinis sexdecim pedum ; et ille qui terram prebet debet habere dimidium murum absolutum et desuper pannam suam ponere et edificare.—J. S.

the 6 and 7 Anne, cap. 31, and here we find the first regulation prohibiting party-walls being constructed of wood. Several Acts were passed during the reigns of the second and third Georges regulating party-walls, the width of streets and various other matters; but in 1774 a really strong Act was passed (14 Geo. III. c. 78), which forms the basis of our modern Acts, and some of the provisions of which it may surprise you to know are still in force. This was the first Act which effectively provided for a supervision of buildings by surveyors. The whole of this Act remained in force till 1844, when an Act was passed (the 7 and 8 Vict. c. 84),* which continued till the present Act of 1855 was passed. Now this Act of 1844 had been superseded long before I had anything to do with building operations, and therefore I am unable to speak with any experience of its working, but a careful perusal of it has driven me to the conclusion that, although manifestly imperfect, it was in many of its provisions superior to the 1855 Act. I will now only shortly allude to these points, as I shall have occasion to refer to them again, more in detail. (1) It provided a special court of appeal; (2) it placed the buildings, which are now entirely exempted from all superintendence, under special supervision; (3) the regulations as to carrying out work to any party structure are less likely to lead to dispute than in the existing Act; (4) it contains regulations as to drainage and as to width of streets which certainly ought to be comprised in any Building Act; (5) it contains better and more complete regulations as to footings of walls than the present Act or Bye-Laws. In 1848 came the City of London Sewers Act (11 and 12 Vict. c. 163), and an amendment of the same in 1851 (14 and 15 Vict. c. 91). In 1855 the Metropolis Local Management Act (18 and 19 Vict. c. 120), and the Metropolitan Building Act (18 and 19 Vict. c. 122), which are the Acts chiefly in force now. But to the former there have been passed no less than six Amendment Acts, in 1856, 1862, 1875, 1878, 1879, and 1882; while to the latter five Amendment Acts have been passed, in 1860, 1861, 1869, 1878, and 1882. There are also the Bye-Laws of the Metropolitan Board of Works, and the Public Health Act, 1875. Although some of these were of only temporary nature, yet it is a fact that there are at the present moment no less than fourteen separate Acts in force in this metropolis. And now the County Council are promoting their Barking Creek Bill,† which contains other amendments affecting the general regulations for buildings, and I ask confidently, is this a state of things which ought to endure any longer? This County Council Bill purports to be a Bill for the improvement and alteration of a bridge over Bow Creek; then it goes on to provide for the purchase of Brockwell Park in the parish of Lambeth; then comes a clause about providing music in gardens and open spaces; next we get powers to appoint members on the Thames Conservancy

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* The list tabulated some four years ago by Mr. Woodward has been of much assistance to me, but, very curiously, this important Act is omitted from the list.—J. S.

† A Bill, proposed to be cited as "The London Council (General Powers) Act 1890," and entitled "A "Bill to provide for the Improvement and Alteration of a Bridge over Bow Creek at Barking, and the acquisition "and management of Brockwell Park, and to confer various further powers on the London County Council." This Bill was reported on by the Council of the Institute, in a Paper dated 3rd March 1890, published in *The R.I.B.A. Journal*, vol. vi., page 241. It has been considerably altered in Committee.

Board; then, hey presto! power to erect a mortuary; and then follow a number of clauses which pertain strictly to a Building Act proper. Verily an olla podrida of a Bill!

Now, Sir, is this the sort of way in which London ought to be legislated for? Is it not desirable, nay essential, that all regulations as to streets and buildings, whether of a sanitary or a constructional nature, should be codified and embodied in a single document plain and easily understanded of the people, and accessible to all, and that this piecemeal, haphazard, sporadic kind of legislation should cease?

Now what should be the end and aim of an exhaustive Building Act for a great city? I will endeavour to lay down the general lines on which such an Act should be drawn, and I propose to examine the present building regulations, and to show how these require to be supplemented. Both streets and buildings should be dealt with in one Act, which should regulate (1) the width, (2) the construction, (3) the sewerage, (4) the gradient of all new streets, (5) the line of frontage of the houses abutting on them, and (6) the provision of a sufficient number of adequate open spaces. I, of course, include in the term "street" all public ways devoted to the public use in and about a town, such as squares, bridges, viaducts, &c. With regard to buildings, it should define clearly what constitutes the difference between a public and a private building. As to the former, *i.e.* public buildings, it should exercise control over their situation, their construction, and the means of ingress to and egress from them. In all buildings the Act should endeavour to secure the prevention of fire, due stability, and healthiness; and for these purposes it should control (*a*) the site, (*b*) the construction of foundations, walls, floors, roofs, and chimneys, (*c*) the drainage, (*d*) the amount of open space about a building, and (*e*) the height of the building in relation to its position—I mean with reference to the width of the street in which it is situated, and to adjacent buildings. Generally, it should regulate the relations between adjoining owners, and the disposition of all dangerous, ruinous, or neglected structures. It should provide an executive for carrying out its provisions, and it should constitute a special court of appeal for all disputed matters. I am quite aware that this summary of the regulations which should be embodied in a Building Act will be considered by some to contain faults of omission, and by others faults of commission; but it will facilitate criticism of the various points if they are examined somewhat more in detail. I ought to say that, in my opinion, regulations as to carrying on noxious and offensive trades, as to compulsory notification of infectious diseases, as to the conduct and arrangement of common lodging-houses and tenement-houses, and all similar matters, should be relegated to a special sanitary code, as is the case in New York.

As to streets, the Metropolitan Building Act and the Metropolis Management Act are silent, but in the Amendments to the latter, and in the Bye-Laws of the late Metropolitan Board of Works, regulations as to streets are laid down, but, curiously enough, nothing is said as to the *construction* of new streets. Now undoubtedly the materials to be used in the construction and making of all new streets ought to be

prescribed and determined by the governing body of every town or city, and, moreover, provision should be made for a subway in every new street, wherein all the gas and water mains and the culverts for electric light wires might be laid. I do not say that a hard and fast line should be laid down and universally applied, but the power to control the construction should exist, as is the case in Manchester. Then as to width: all that the present regulations do is to insist that a new road or street for carriage traffic shall be at least forty feet wide. Now, I say that for any great city, or for its principal suburbs, this is a ridiculously narrow width. As estates become ripe for development, they generally fall into the hands of speculators, and these, unless they be really wise and farseeing men, almost invariably try and get every inch possible into their plots, and consequently will rarely give more than the bare forty feet to roadway, which, remember, includes pathway. The consequence is that in some of the wealthiest and most fashionable suburbs of London we have street after street containing large and highly rented houses, which are simply the abomination of dreariness and dulness because of the narrowness of the road. Such streets are always depressing, especially in this climate of ours, and if those who have the laying out of such estates would only believe that another ten feet to the street would make all the difference between brightness and gloominess, and would render the houses far more attractive to tenants, perhaps some improvement might ensue. And if this is the case with private houses, a minimum of forty feet is less to be tolerated where shops exist. In a thoroughfare with shops on each side, it is certain that frequently in the course of the day vehicles will be either discharging customers or taking in goods, and will therefore be standing against the curb, exactly opposite each other. They will thus take up 12 ft. at least of the roadway. Taking 7 ft. for each footpath is a moderate allowance, and this leaves only 14 ft. of clear carriage-way for carriages, waggons, omnibuses, &c. Consequently the traffic becomes congested, time is wasted, and considerable loss is inflicted on the community. For much-used thoroughfares, with shops on each side, nothing less than a 42-ft. carriage way should be allowed, and Mr. Hosking, in his practical treatise on bridge building, maintains that they should be even wider. But 40 ft., pavement and all, satisfies the present requirements! The Manchester people, twenty-five years ago, were wiser in their generation, for the Bye-Laws of 1865 insist that in a new street where houses of three storeys above the ground are contemplated the minimum width shall be 48 ft. I am not an admirer of the architecture of Portland Place, but there is scarcely a street in London more attractive in consequence of its largeness and ample width. It may be objected that it is scarcely worth while now to lay down any more stringent regulations, because matters cannot be remedied in so large a portion of the metropolis. But we must bear in mind that just as districts, which twenty-five years ago were still country, are now populous suburbs, so twenty-five years hence, what is now country will be town. Large parks and open spaces cannot be had everywhere, but there is no better way of making up for the want of these than by insisting that our thoroughfares shall be of liberal breadth.

I need say nothing as to the sewerage, as I believe in all cases the authorities

superintend the sewerage of new streets. But I contend that they ought to have control over the gradient. It may be objected that the gradient fixes itself. So it does, if, when you are laying out an estate on the side of a hill, you simply carry your streets straight up and down, thereby inflicting incalculable hardships upon the horses and other beasts of burden which use the streets. But if the authorities had power to control the gradient, it would frequently be found that, by a little care, estates lying on the side of a hill could be developed so that the streets, instead of being steep, should be of easy rise, and that without diminishing by one penny the value of the estate. Here again Manchester is to the fore, as in the new Bye-Laws which the Corporation are seeking to obtain such powers are specifically mentioned.

Further, I am by no means certain that the Metropolitan Board Bye-Law as to the cross section of the carriage way is not capable of improvement. Water flows much more readily on asphalte or wood than on macadam or granite, and the slope of $\frac{3}{8}''$ per foot from the crown of the roadway to the curb is more than is required, and this slope on a slippery day causes more accidents than almost anything else, as can be verified by any one who will notice carefully the way in which horses fall on wood and asphalte. The slope of $\frac{3}{8}''$ per foot is 1 in 32, but the Swedish Building Law* prescribes 1 in 50, or rather less than $\frac{1}{4}''$ per foot.

Of the alignment of frontages I need not say more than that its control is universally acknowledged to be a matter of necessity. The somewhat flagrant instances which were brought prominently to public notice not long ago simply showed that the then controlling body did not exercise proper supervision. The provision of open spaces is a matter of the greatest moment, but it was treated so fully by Mr. Woodward, in his Paper on "London as it is and as it might be,"† that I need only call your attention again to the fact which is there mentioned, that whereas Paris has one acre of park or open space to every thirteen inhabitants, and Vienna one acre to every 100, the inner ring of Greater London, with its population of between four and five millions, has only one acre per 1,000 inhabitants.

The County Council ought to possess powers to enable them to insist that a certain proportion of all land, within a distance of (say) fifteen miles from Charing Cross, which is laid out for building, should be devoted to the public. I do not say that the owner of the land should give up this amount without compensation, but that he should be prohibited from building on the whole of it, and that what is required for open space should be paid for at a fair valuation. No question is here involved of any large space, like Epping Forest, or even Clapham Common, but such modest spaces as Camberwell Green, with its $2\frac{1}{2}$ acres, would, if properly situated, make an enormous difference to the inhabitants round them.

I now come to building regulations proper. And first as to public buildings. The present definition of a public building is not wide enough, and the clause defining such a building should run thus, which is the definition in the Manchester

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* *Notes on Swedish Building Law*, by Mr. Alex. Beazeley, in Transactions, N.S. Vol. II., page 115.—J. S.

† Transactions, N.S. Vol. II., page 60.

Bill to which I have before alluded : "Public Building means a building used or con-
"structed or adapted to be used either ordinarily or occasionally as a church, chapel, or "other place of public worship, or as a hospital, workhouse, college, school (not merely "being a dwelling house so used), hotel, refreshment room, theatre, public hall, public "concert room, public ball room, public lecture room, or public exhibition room, or as a "public place of assembly for persons admitted thereto by ticket or otherwise, or used or "constructed or adapted to be used either ordinarily or occasionally for any other public "purpose." Considering the enormous importance of securing the safety of buildings where a large number of persons congregate, the definition of such a building should be as wide as possible. The present Act, with its amendments, gives the County Council, through the district surveyors, control over the construction of public buildings, but it has this initial and cardinal defect, that it cannot forbid such a building to be erected, or what was previously a private building being turned into a public one if the construction be approved. Looking at the increased risk of fire in public buildings, it is certain that many sites on which some of the smaller music halls &c. are erected are absolutely unfit for these buildings, and they ought not to be permitted. I should unhesitatingly contend that no public building of any kind should be erected with a frontage to one street only. However carefully we may construct such a building, there will surely be stored in it much material of an inflammable nature, and accidents will certainly occur unless there are exits on more than one side. The New York Building Act is very stringent indeed on this point, and provides that, in the case of a theatre or building of that sort which has a frontage to one street only, there shall be open spaces for exit on each side, and that the whole area shall not be covered [fig. 54]. Therefore powers should be given peremptorily to forbid the erection of a public building if in the opinion of the proper officer the site is not suitable. Further, the existing powers are not sufficient, and the surveyors ought to have control over the following points: (1) Width, strength, security, and fire-resisting construction of all lobbies, corridors, passages, landings, and stairs; (2) Freedom of lobbies, &c., from all inconvenient barriers, and steps of narrow tread or curve; (3) Strength and security of railings and balustrades; (4) Number and width of openings for ingress and egress and method of opening same ; (5) Means of ventilation and provision against overcrowding or overheating; (6) Provision for water supply and for extinction of fire; (7) Provision for cleanliness and against nuisances. I should like here to call attention to the good work done by the Manchester Society of Architects, and to congratulate them upon the result of their urgent representations to the Corporation on this matter. In the Manchester new draft Bill are the following provisions which were suggested by the Society and adopted: "All doors between the public room and the outside of the building shall be hung to

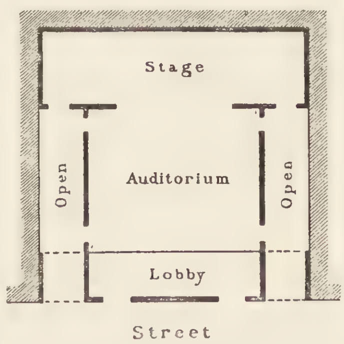

Fig. 54.—A Theatre with Front to Street only, in New York.

" swing in and out, or, when made to open in one direction only, such direction shall be " outwards. . . . No projections of any description whatever must be formed in any " passage or entrance between the public room and street within 6 ft. from the floor. The " walls to be properly sunk for any doors required, so that when opened back they shall " be flush with the wall. Public staircases to be not less than 5 ft. in width in all " cases "—I certainly think this too narrow,—" but larger in proportion to the number " of persons to be accommodated; no single flight to consist of more than ten steps; each " flight to have a landing and no winders, and all public staircases above 6 ft. in width " to be divided down the centre by a strong handrail with proper supports. Adequate " means of ventilation shall be provided. The several matters above mentioned shall " be maintained in good order, repair, and efficient action." I consider these most excellent provisions, and it is infinitely preferable to have them laid down specifically in an Act than relegated to bye-laws. And the district surveyors should be responsible for carrying out these provisions.

I now come to the general provisions of a Building Act, and the first thing to be aimed at is the prevention of fire. This was the main object of the present Act, but many of its provisions are superfluous, and many that should exist are wanting. First, as to those much-debated clauses limiting the cubical contents of a building, but permitting two to be united under certain conditions of iron doors, &c. I maintain that the restriction as to cubical contents is unnecessary as a hard-and-fast rule. In the Bill which the late Metropolitan Board promoted, but failed to pass, in the year 1874, the limit of 216,000 cubic feet was altered to 300,000, but this is equally objectionable. Certain warehouses are used for purposes which absolutely preclude risk from fire, and there ought to be a discretionary power of allowing larger buildings if sanction is obtained and if the authorities are satisfied with the construction of the building. I myself have acted for several years for a large manufacturing company whose business would be absolutely stopped if they had to divide their stores by brick walls. Their factory is not within the metropolitan area, but in one of the suburban parishes, whose bye-laws are framed on the Building Act model. But here the chief surveyor took upon himself to do what all district surveyors ought to have the power to do; viz., to investigate the special circumstances of the case, and not to be tied down by strict literal interpretation. This clause affects Electric Lighting Companies most materially, and the London Electric Light Corporation got a clause inserted in their Act that they should not be limited as to cubical contents. So much has been said on previous occasions as to the absurdity of providing iron doors without any obligation to keep them closed that I need not refer more particularly to it. But there is one matter which has not, as far as I am aware, been noted, which is, that although Sect. 28, Clause 4, provides that all openings that have been made between two buildings in the same occupation shall be blocked up with brick or stone when the joint occupation ceases, there is no obligation to give notice of the cessation, consequently no control can be had over this. Only within the last few weeks, at some business premises which I am now altering, I found two openings into the next premises, which had been

simply matchboarded on each side, and had not been stopped up in the slightest degree. A few years ago I found precisely the same thing in a warehouse in the City, and if in the course of a not very long experience I have met with two such cases, it is not unreasonable to infer the existence of many, showing that this portion of the Act is inoperative. Then, again, all the provisions as to fire-resisting construction require remodelling. So much more is known now than was the case thirty-five years ago as to the behaviour of stone and iron under heat, that it is absolutely criminal to allow stone staircases carried on unprotected iron supports in buildings used as flats or tenement houses (see Clause 22 of the 1855 Act). Although the draft Bill before alluded to of 1874 embodied considerable improvements in this respect, yet even here we find *iron* set down without any qualification as a fire-resisting material. Clause 19, Sect. 2, of the Building Act is presumably intended to limit the risk of fire. It states that the plane of the surface of the roof of a warehouse, or other building used either wholly or in part for purposes of trade or manufacture, shall not incline from the external or party walls upwards at a greater angle than 47 degrees from the horizon. Now, after considering this very closely, I cannot see any reason for so strict a limitation, which, moreover, bears very hardly indeed in certain cases. Take, for instance, an electric lighting station, the ground floor or basement being used for engines and dynamos, and the first floor for storage batteries, the total area being, let us say, 5,000 feet. It is necessary to provide living rooms for the resident engineer, which would occupy about 800 superficial feet. The most natural way of doing this would be to cover the general body of the building with a flat, and to have a mansard roof for the remainder, and there is not an architect here who could not construct such a building in this way and make it perfectly safe and commodious. But if the district surveyor, in order to save himself the trouble of taking any responsibility, simply takes his stand on the letter of the Act, under the clause in question he can absolutely prevent the erection of such a building. Fortunately all surveyors do not act in such an arbitrary manner, but what I contend for is that here, and in nearly all other cases, they ought to have discretionary power. It has been stated that in New York mansarde roofs are not allowed, but, as far as I have been able to ascertain, this is a complete mistake. What is insisted on is that they shall be built to the satisfaction of the building inspector, so as to be fire-resisting—which is a very different thing. A further provision to insure safety from fire which should certainly find a place in a Building Act is that when buildings occupied as dwellings exceed a certain height, they shall be provided with fire-escapes to the satisfaction of the superintending officer, and that the means of access to such fire-escapes shall be approved by him. This is provided in New York, and an amusing story is told of one particular case, where a House of Correction —I think—had been built without these fire-escapes, and the Building Department insisted upon their being provided. This was done, and everyone was satisfied, till one day some inquisitive person made a careful inspection, and found that in every case the fire-escapes were carried up to windows that were so effectually protected with stout iron bars that no one could possibly have gained access to the escapes from

the inside of the building. This shows, of course, that without proper supervision "the best laid schemes gang aft agley," but when one reads of the terrible loss of life and suffering inflicted by such fires as that not long ago in the Edgware Road, the necessity for a provision of this kind must be evident to all.

Then, again, the clause relating to stoves or ovens used for trade purposes certainly needs remodelling, and I think Mr. Woodward's criticism on it in the short article which was published two months ago in *The R.I.B.A. Journal* [vol. vi. pp. 75–78] perfectly fair. Although the floors are to be formed of incombustible materials, nothing whatever is said as to their thickness.

In connection with this part of my subject, I should be glad to know why the bye-laws of the County Council insist that a tall chimney shaft shall have a specified batter. It may frequently happen that such a chimney shaft would look far better if the diminution in thickness were made by a series of set-offs, rather than the whole shaft carried up on the batter. Perhaps, however, the late Metropolitan Board were so enamoured of that beautiful rule in the second part of the first schedule, regulating the thickness of warehouse walls—which, if strictly carried out, would make all warehouse walls batter both inside and outside—that they refused to contemplate any construction connected with a factory or warehouse that did not batter.

My next point, viz., the securing of due stability, is a most important one, and it has so many ramifications that it would be impossible for me to treat it fully this evening. There is nothing, in my opinion, to find fault with in the thickness of walls in relation to their height, as laid down in the Building Act. It is, I think, the minimum thickness that should be allowed, though it is a curious fact that in New York dwelling-house walls are allowed to be built to a height of 55ft., only 12″ thick, and in warehouses, 40ft. high, of the same thickness; and it is certain that in France walls are carried up to a height of over 80ft., with a thickness of 18″ only. The thickness is not definitely laid down in the French Building Laws, but it must be "d'épaisseur suffisante pour l'élévation qu'il y aura au-dessus." In other respects than thickness the Acts leave much to be desired. The minimum thickness of concrete foundation required is 9″, with a projection of 4″ on each side of the lowest course of footings, and this entirely irrespective of the height or thickness of the wall or of the character of the building, and no discretionary power is given to the district surveyor to insist upon more than this. Neither the thickness nor the projection can possibly be sufficient in many cases, and the provisions as to the composition of mortar and cement, &c., require remodelling, not however in the way of greater definiteness, but rather in the direction of enabling the district surveyor to satisfy himself as to the article being properly made.

But perhaps the most crying defect in the Building Acts is that the controlling officers have no power whatever over the materials used other than bricks and mortar, and it should certainly not be difficult to frame a schedule on the same lines as that defining the thickness of walls, stipulating, for instance, that lead for gutters shall be of not less than, say, five pounds weight per foot super; that zinc shall not be less

than sixteen ounces; that floor joists shall be of a certain minimum size for certain specified lengths of bearing, and shall have bridging when exceeding certain bearing; that rafters, purlins, &c., shall have certain minimum scantlings, and that floorboards shall not be less than one inch thick. Any one who has watched the manner in which surburban houses are built, who has seen the materials used in them, will have no hesitation in affirming the need of such provisions, and I should imagine the district surveyors themselves would welcome them more warmly than others, as they must frequently have to shut their eyes to what they know is most rascally bad building. Then take the use of iron in all kinds of buildings, offices, private houses, &c., which has increased so enormously of late years that it is surely time to lay down some regulations as to its use, such as, for instance, the minimum depth of a girder spanning a certain opening; or, if you prefer it, lay it down that in dwelling houses the supports of floors shall be calculated to carry one and a quarter cwt. per foot super on all floors, and warehouses so much more, and make the builder responsible to the superintending officer to satisfy him that all his supports are calculated to carry the weight. This may sound Utopian, but put it into general words and ask yourselves whether it is so preposterous as it may seem when stated in detail, to ask that there shall be some legislative control over persons who build, compelling them to erect their walls, floors, &c., strong enough to carry the load which they will have to bear. Is that Utopian? Is it not rather the most literal plain common sense if you are to have any legislative control at all? At any rate, the authorities in New York do not think it too much to have such provisions in their Building Acts. If you tell me this is going too much into detail, well and good; leave out all details, but give your superintending officials power to satisfy themselves as to the stability in each individual case, and make them responsible. There is one special case of stability which deserves to be particularly mentioned. Every architect knows that extra precautions must be taken in the case of a corner building used as a shop on the ground floor when the angle is canted off, and yet if attempts are made to specifically prescribe what shall and what shall not be done in such a case, you will find hopeless confusion result. In the 1874 Bill the late Metropolitan Board tried it, and utterly failed; in fact, this part of the Bill broke down completely when the witnesses were cross-examined. But this does not mean that no legislative interference should be attempted, but that the controlling officers, viz., the district surveyors, should be empowered to have the special construction in each individual case made clear to them, and should then be responsible for the safety of the structure.

Next to the stability of buildings comes the healthiness. Now with regard to drainage I think the sanitary officers of the various vestries do their duty uncommonly well considering the enormous amount of work which they have to do, but I cannot help thinking that a divided control is unwise, and that the same officer who is responsible for the erection of a building should be also responsible for its sanitation. Certainly a Building Act ought to have provisions regulating subsoil drainage, the materials for drains, the method of laying, disconnecting, and of ventilating them, and

also prohibiting the use of what are universally admitted to be apparatus dangerous to health, such as the D trap and certain kinds of closets.

But the healthiness of a dwelling depends upon far more than drainage. Dampness and insufficient ventilation are terrible foes to health, and scarcely anything is said in the existing Building Acts on this subject. It is true that one of the bye-laws provides that the site of every building shall be covered with a layer of good concrete, except in certain cases, one of which is that the site be "natural virgin soil." Now, I could take you to districts in the neighbourhood of London where within the last few years acres upon acres of land that was natural virgin soil have been covered with small house property, and where I have myself seen six or eight inches of water under the ground floor joists, due entirely to the nature of the soil. Such sites soon become absolutely pestilential, the woodwork of the houses begins to rot, and their inmates to suffer from chronic and permanent ill-health. Other large towns and cities are in much the same condition as London, and for the same reason, which is that when towns begin to increase, it is the good dry sites that are first built on, and it is only the pressure of population which compels the erection of buildings on low-lying, damp sites. As those sites become covered with houses it is more and more necessary to insist upon stringent regulations as to the construction of the houses. There is no provision for underground rooms being to a certain extent protected from the damp either by the walls being built in cement or by forming a dry area; and as in many cases it is only too certain that sooner or later such rooms will be used as habitations, the necessity for such legislation is manifest. In the Manchester Bill, to which I have before alluded, powers are very wisely obtained for insisting that the external walls of dwelling houses where the lowest storey is below the level of the ground and no dry area exists, shall be constructed with a two-inch cavity, and that the inner and outer linings shall be well and securely bonded together.

One of the most crying evils of large cities is the close juxtaposition of the houses, and a regulation prescribing a minimum distance between the backs of all houses, large or small, is most urgently needed. The provisions of the present Building Acts are practically a dead letter. Exception has been taken to the words of section 14 of the 1882 Amendment Act (as to open spaces to dwellings), which only applies to buildings erected on a site not previously occupied, but I am bound to say—much as I regret it should be so—I see no help for this when dealing with such a city as London, or practically rebuilding could not take place at all if the regulations were carried out in full. But, when the clause is examined, it is positively ridiculous, because it simply prescribes the *area* of the open space in rear. A building with 50 ft. frontage and 50 ft. in height need only have an area at the rear of 450 square feet, that is, nine feet deep! No restriction beyond this exists anywhere as to the distance of buildings from one another at the back, and this most unwise provision (which has also been adopted by sundry vestries, just outside the area of the jurisdiction of the County Council) has brought about a state of things in parts of Hampstead near the Finchley Road station—I allude to the road known as Broadhurst Gardens—which appears to

me positively scandalous. Apart altogether from the question of health, the danger of fire spreading is enormously increased, if houses are packed so closely as this. I should contend most confidently that the minimum depth of the open space that should be allowed at the backs of houses should depend on the height of the houses themselves, and that the frontage has nothing at all to do with the question, and I should say that this open space should equal the height of the building. One of the greatest defects of the Paris Building Regulations is, that they permit buildings fronting different parallel streets to back on to one another—in other words, they allow the back wall of a building to be a party-wall. Of course, a similar restriction should apply laterally, i.e., that if a row of houses have back additions, these should be no higher than the width of the space between any two of them. Further the height of the fence walls dividing premises should be subject to regulation. This brings us to the important question, as to whether any limitation in the height of buildings facing public streets should be legally enforced. This question has been discussed here more than once, and very different opinions are held upon it. In 1874, when the Metropolitan Board of Works were promoting their new Building Act, a great deal of evidence was taken on this point, the Board desiring to limit the height to 65 ft. In the minutes of evidence taken before the Select Committee of the House of Commons on this proposed Act, some interesting facts are stated, and the late E. M. Barry, R.A., prepared various diagrams showing the heights of existing houses in London [figs. 55 and 56] and Paris [figs. 57 and 58]. Mr. Barry, who was one of the witnesses, also said: "It seems to me there must be a limit of some kind. It could not be tolerated, for "example, that every one should build his house the height of the Victoria Tower, "therefore a limit of some kind must be imposed, . . . subject to relaxation in excep-"tional cases, either of construction, or of site, or of general circumstances." This answer gives generally the broad reason for some restriction. I myself think that the width of the street should govern the height of the building as a general rule. This is the case in Paris, in nearly every city of the German Empire, and in Sweden. In Paris the following rules were in force:—

					Up to 1884 mètres	Altered in 1884 to mètres
In streets not exceeding		7·80	wide,	height of walls	11·70 .	. 12·00*
,,	,,	9·75	,,	,,	14·60 .	. 15·00
,,	above	9·74	,,	,,	17·55 .	. 18·00
,,	,,	20·00	,,	,,	20·00 .	. 20·00

No part of the roof may transgress a line forming an arc of a circle whose radius is half the width of the street, but a radius of 5 mètres is allowed for streets under 20 mètres wide, and the radius may not exceed 8·50 mètres whatever the width of the street.

In Munich the height of buildings must not exceed the width of the street, except that buildings in streets less than 12 mètres wide may be 12 mètres high, but no building may exceed 22 mètres. In Sweden streets 32 ft. and less may have houses 43 ft. high;

* See *The R.I.B.A. Journal*, vol. ii., p. 184.

up to 44 ft., houses 54 ft. 6 in. high; and streets above 44 ft. may have houses 66 ft. high. Some such stipulation as this I think eminently reasonable, but I would certainly give the power to relax the regulations in certain cases. There can be no doubt, however, that the higher the building the more the construction should be

Fig. 55.
Grosvenor
Gardens, S.W.

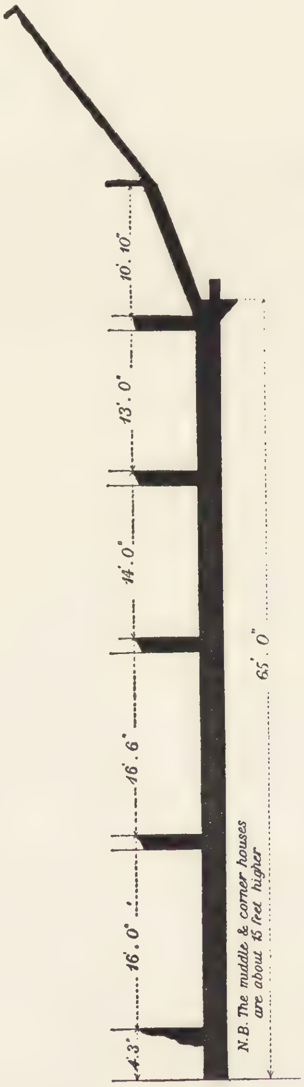

Fig. 56.
Grosvenor Place,
S.W., 1867.

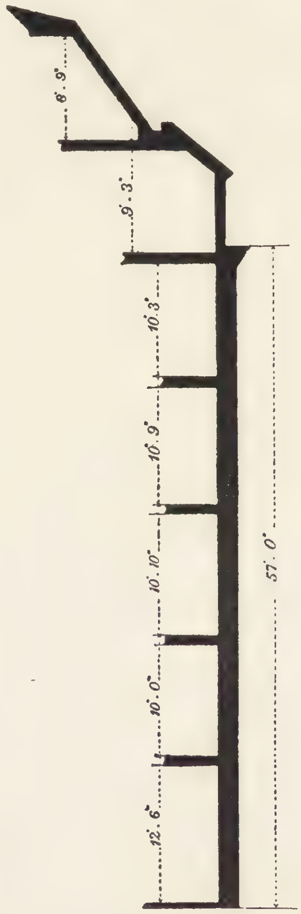

Fig. 57.
Boulevard Sebastopol,
Paris.

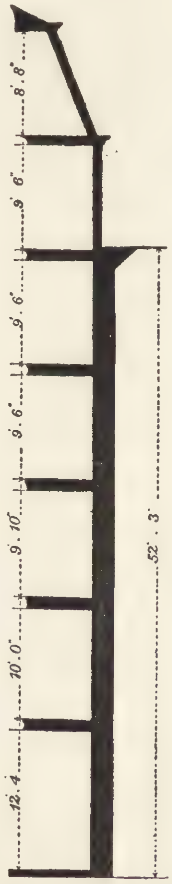

Fig. 58.—Place du
Prince Eugène,
Paris.

carefully considered, and if any one wishes to erect a building higher than say 65 or 75 ft., he ought to obtain special permission, and should satisfy the controlling officer of the Building Department as to fire, resistance, stability, &c. The clause as to height in the draft Bill of the London County Council says nothing as to roofs or chimneys;

but if the walls are restricted I think there should be some restriction on roofs and the living-rooms in them. I have no wish to see adopted here the monotonous skyline of the Paris houses, and in order to avoid this I do not think there would be any difficulty in framing a clause to the effect that if the front of a building be carried up as a gable, then the limit of height shall apply not to the apex but to half way up the gable. This would, I think, have great effect in securing broken and picturesque skylines. This matter has been discussed in *The R.I.B.A. Journal* so recently that I need not refer to it further here. To conclude this portion of my subject, no house ought to be allowed to be inhabited as a dwelling, or occupied as a place of business, without a certificate from the proper authority that it has been erected in accordance with the regulations of the Act.

The regulation of the relations between adjoining owners as to works to party structures is an essential part of any Building Act, and on the whole I should say the provisions of the existing Act answer the purpose fairly well, but they are certainly capable of improvement in one respect. All party structures are treated alike, so that, if a building owner wishes merely to put an extra course of bricks on what is practically a party-fence-wall, but which has the smallest erection built against it on each side, it is necessary to give all the prescribed notices ; and if the adjoining owner, for any purpose of his own, does not acknowledge the notice, all the machinery of appointing surveyors, &c., has to be set in motion, just as much as if a whole party-wall between two buildings were being pulled down and rebuilt. It may be thought I am exaggerating, but a careful consideration of the Act of 1855 will show that this is not the case. No definition of a party-fence-wall exists, and a party-wall is defined to be a wall not only " used " but " built in order to be used as a separation " of any building from any other building." A decided improvement was suggested by the 1874 Bill, which defined a party-fence-wall, prescribed one month as sufficient notice for any alterations to such a wall, and reduced the three months' notice for any party structure to two months—which, I think, is ample. Even in the case of a wall actually separating buildings, when the alteration required is very slight, most vexatious and costly delay may be caused through the adjoining owner not acknowledging the receipt of notice. The 1844 Building Act had a very wise provision, under which, if the adjoining owner did not give his consent, the matter was referred to the district surveyor, who was required to report on the nature and proposed method of performing the required work to the official referees—who now no longer exist. Some such arrangement as this would tend to avoid much of the waste of time which now almost invariably takes place in connection with work to a party-wall.

There is one special matter affecting adjoining owners which must not be passed over, I mean the regulation of rights of light and prospect. And a very difficult question this is. If a comprehensive Building Act were in operation, it would prevent all acquisition of prescribed rights of light in the future, because as I have shown it would always enforce the existence of a certain space between buildings, and this space would invariably allow sufficient light to reach all windows. But with regard to the rebuilding

of old structures, as for the last sixty years there has been a positive enactment as to ancient lights, the "Prescription Act of William IV.," I am of opinion that you will find it very difficult for any hard and fast rule to be laid down, as some persons have hoped, embodying an angle of 45°, or something of that sort. Every individual case must be judged on its own merits. In some cases the raising of a wall within the 45° line would inflict very serious injury on the dominant building; in others you may go far beyond that angle without any perceptible diminution of available light.

In Scotland there is no right of light under prescription, or under statute, and many people would gladly welcome such a state of things here. In fact, on more than one London estate, every new building agreement and every lease contains a proviso preventing the lessee from acquiring, by length of enjoyment, prescription, or any other means whatever, any rights of air or light. But of course this can have effect only as against the other lessees on the same estate. But still, whether this state of things can ever be brought about or no, I do think something might be done to simplify the machinery for settling such disputes. In far too many cases, the damage inflicted by raising buildings is infinitesimal, and there cannot be the slightest doubt that injunctions are often applied for with the sole purpose of getting something out of the pocket of the building owner by threatening serious delay to his works. The Science Standing Committee are now considering the subject, which they find a knotty one, but I think there is some approach to a consensus of opinion that proceedings might be authorised somewhat on the lines of the party-wall provision of the Building Act, as suggested by Prof. Roger Smith. That is to say, that a building owner might give notice of rebuilding to all parties who could possibly be affected by raising walls higher than they were formerly, and that, after notice given, three surveyors should be empowered to investigate the matter, and to decide by a majority whether the building would inflict any injury upon any one interested, and, if so, what money compensation would represent the injury. This tribunal should have power, on the one hand, absolutely to veto the proposed rebuilding if the damage would be serious, which would be a very rare occurrence; and on the other, to permit it and assess the damages, if they should be slight. Some clause of this sort would be an immense gain to a Building Act in force in a large city.

With reference to ruinous, dangerous, and neglected structures, I need only say that it is absolutely essential that a Building Act should have power to enforce the repair or demolition of such buildings as through neglect have become a source of danger, and that, as far as I have been able to learn, the existing provisions answer their purpose fairly well. But in this portion of the Act the words "vacant ground" ought to be added to "structures," because it frequently happens that after a building has been pulled down, the site for some reason remains for a long time unoccupied, and becomes a mere rubbish heap and receptacle for refuse, and assuredly the County Council should have the power under a Building Act to deal with such a case.

With regard to exempted buildings, I confess I do not see why certain buildings should be exempt from all control, because certain of the regulations of the Act are

not applicable to them, and I think that it is essentially a wrong principle to allow this exemption.

And now suppose we have a liberally conceived, comprehensive Building Act, well drawn and lucid in its provisions, it is certain that disputes and differences of opinion will arise. To whom are these to be referred? The great desideratum is that the machinery for enforcing the law should be simple, direct, efficient, and inexpensive, and that there should be uniformity of procedure. What happens now is precisely the reverse of this. It is notorious that a conscientious district surveyor who desires to enforce upon a delinquent builder the carrying out of the provisions of the Building Acts has the greatest difficulty in doing so. The magistrates and county court judges who have to be appealed to generally evince annoyance when Building Act cases are brought before them, because they know that they are deficient (and small blame to them) in the technical knowledge requisite for the proper adjudication of such cases. The consequence is, that, instead of having uniform decisions, there are about as many different decisions as there are judges, and, knowing this, builders are often quite prepared to set the district surveyor at naught, and to run the risk of an adverse decision; and the district surveyor will frequently put up with what he feels to be wrong, as he knows how difficult it is to enforce the right. Moreover, he takes the chance of having to pay the cost of a summons out of his own pocket, and in any case the delay and waste of time caused by these cases being taken to courts which are frequently overcrowded with ordinary cases are frightful.

The Metropolitan Board more than once attempted to get a special magistrate appointed for these cases, but it is doubtful whether this would have worked much better, and I am confident that we must go back to the 1844 Act if we want the pattern of a tribunal fit to deal with building disputes. Clause 80 of that Act ran thus:—"And now for the purpose of providing for the appointment of competent "official referees to superintend the execution of this Act throughout all the districts "to which it is applicable, and also to determine sundry matters in question incident "thereto, as well as to exercise, in certain cases, a discretion in the relaxation of the "fixed rules and directions of this Act, where the strict observance thereof is im-"practicable, &c., &c., be it enacted that it shall be lawful for one of Her Majesty's "Principal Secretaries of State and he is hereby empowered to appoint two persons, "being of the profession of an architect or surveyor, to be official referees of metropolitan "buildings." And then it goes on to define their functions and the matters which are to be referred to them for settlement, which practically included all matters dealt with in the Act. They were to have all the powers of arbitrators appointed by one of the High Courts of Justice, and their award was made identical with an Order of Court. Now, when I first read these provisions they seemed to me so admirable that I could not understand why they obtained for so short a time as eleven years, and were not reproduced in the 1855 Act. Upon making inquiries, and looking up some evidence on this point, it appears that the appointment of these official referees was complicated by the appointment under the same Act of a Registrar of Metropolitan Buildings, whose duty it was to

seal the awards of the referees, but he had also the power of refusing to do so if in his opinion these documents were informal, incomplete, or contrary to law. Now, knowing what human nature is, it is not surprising to find that the referees and the registrar soon got to loggerheads, and the friction between them became so intense that on October 1, 1850, Lord Seymour, who was then the Chief Commissioner of Woods, instructed the late Justice Mellor, who was then at the Bar, and the late Joseph Gwilt to investigate the causes of the disputes that had arisen, and to report to him fully thereon. This they did in a document which was printed by order of the House of Commons in 1851. This is a very interesting report, and as a result of their investigation we find that they recommend—and the late Sir William Tite supported the recommendation—that a tribunal should be constituted, consisting of two persons, one belonging to the legal and one to the architectural profession, who should sit together in some central place permanently, having certain clerks under them, and one assistant architect, and that all disputes relating to easements, arising within the district covered by the Building Act, such as rights of way, rights of light and air, &c., should be referred to the determination of this Building Court. Now, this appears to be the beau-ideal of a tribunal for all building disputes. It is scarcely too much to say, that in many cases, however carefully he may weigh the evidence, a purely legal assessor cannot do justice, because the evidence does not suggest to his mind what it would to one who had had a technical training; the architect would thus furnish the technical, and the barrister the legal knowledge required, and if due care were exercised in the selection of the individuals, I believe this would form a very strong court, whose decisions would be rarely disputed. As a result of the report to which I have alluded, attempts soon began to be made to frame a new Building Act, and in the first three Bills which were introduced into Parliament—two by Lord Seymour, and one by Lord John Manners—a tribunal was constituted exactly on the lines of the report. Then suddenly, in 1853, this was dropped, and finally, in 1855, the present Act was passed, which was sadly injured by the lack of this provision. It is interesting to note that, before the Bill became law, it was criticised very unfavourably by the *Builder*, wherein Lord Seymour's Bill was referred to as the only one which held out hopes of permanent benefit and utility.

The success of a Building Act depends largely upon its administration, and it is impossible to avoid some reference to those who have the administration of the 1855 Act, but I earnestly hope that no individual district surveyor will feel hurt at anything that I say about this body. I have always personally met with the greatest courtesy and kindness from those with whom I have been brought into contact, and I number many among my personal friends. But it behoves such a body jealously to guard against abuses, and there can be little doubt that abuses have crept in. If it be true, as was stated before a Committee of the House of Commons, that one district surveyor held his office for years after he was totally unable to climb a ladder, his duties being performed not by a properly authorised deputy, but by a clerk—if it is a fact that another surveyor found two hours a week sufficient for the personal administration of

a large district, nineteen twentieths of the work again being done by a clerk—if cases like these, or anything parallel to them, now exist, it is a state of things which was certainly not contemplated by the framers of the Building Act, and it is no wonder that the office has fallen somewhat into disrepute in the eyes of the County Council. By insisting on the passing of an examination as a test of fitness for the post, the Legislature certainly intended the administration of the Act to be the personal duty of those who were appointed *ad hoc*, and if the remuneration of the office is not sufficient to make this personal attention worth while, then it certainly ought to be increased. But the greatest defect which I find is incidental to the Act itself, in that it does not allow the district surveyors to exercise the slightest amount of discretion, or to take the least responsibility beyond seeing that the bare letter of the law is insisted upon, however useless may be the insistence, however great the hardship it may inflict, and however harmless might be a slight relaxation. This, it seems to me, is fatal to the proper administration at the present time of an Act thirty-five years old, dealing with building operations in which new methods and new materials are constantly coming into use. Such an Act should be administered with an iron hand when the evasion of its provisions might by chance result in danger to life or health, but in other cases the hand should be clothed with a velvet glove. Many surveyors feel the absurdity of their position, and are willing to give themselves a great deal of trouble, when they see that the literal compliance with unnecessary regulations of the Act would inflict undoubted hardship upon those who have no desire to evade the restrictions imposed which are really essential to good and stable building, in order to mimimise the hardship as much as possible; and Professor Kerr has had the courage, in his excellent work *The Consulting Architect*, to lay it down as a general rule that "whenever a case occurs in "which the letter of the law is plainly oppressive, it is the duty of the district surveyor to "get rid of the oppression if he can," with which opinion I cordially agree. But others will budge never an inch from the *litera scripta*, and if asked for the slightest relaxation, they will say with Shylock, "I cannot find it, 'tis not in the bond." The consequence of these two ways of regarding their duty is that there is no uniformity in the administration. Things are winked at in one district that are sternly refused in another, and this acts prejudicially in two ways. I am not so foolish as to think that if discretionary power were given to district surveyors, that power would always be exercised in the same way, but you will get rid both of the blind eye and of the unreasoning refusal of consideration. If any officer winks at one thing, he may at another, and consequently unconscientious builders are constantly tempted to "try it on," whereas in other cases the most competent architect who has some difficult point of construction to overcome and does it in a perfectly scientific manner, which is, however, not in strict accord with the letter of the law, knows it is quite useless to ask Mr. So and-So's consent, because it will not be given. If the surveyors are armed with discretionary powers to be exercised on their own responsibility, they will always take care to have good reasons both for permissions and for refusals, and I should have thought they would welcome such an alteration in the law. Of course, I quite admit that there

must be some appeal, and the tribunal which I have suggested ought to be the Court of Appeal from any district surveyor's decision.

It may possibly be objected that many of the provisions which I have suggested as essential to a Building Act would, if carried out, unwarrantably interfere with the rights of the individual. Why, it may be asked, should a man who has landed property be prevented from laying it out in any way he may desire? why should he be restricted in the heights of his buildings and in the amount of open space in the rear of his houses, and in various other ways? The reply to this is, that law only becomes necessary when people gather into communities, and all law implies restriction more or less on individual liberty. "Thou shalt not" is the keynote of all legislation from the time of Moses downwards. A person living in the Australian bush a dozen miles from his neighbour may do many things with impunity that would not be allowed in Piccadilly. The good of the community must override the selfish interests of the individual. Only you must be very sure indeed that the well-being of the community is really involved in your restrictive legislation. In this connection I will quote one or two sentences from a work by William Hosking, one of the official referees, published over forty years ago, which seem to me singularly applicable now. "Regulation, "whether it be of buildings or of any other matter at the disposal of individuals, can "only be rendered effectual by the intervention of the Legislature; and as regulation, "when applied by statute, involves both restraint and compulsion, the purposes for "which rules may be imposed and the circumstances under which regulation is required "ought to be such as to command general acquiescence in the necessity and propriety of "the imposition . . . although there will be individual interests to which some of such rules "will be felt or be fancied to be repugnant." Again, "It cannot be doubted that it is the "duty of the State to protect the poor and the ignorant members of a community from "danger in the use of building, as well as to protect neighbouring inhabitants and the "public generally from all possible contingent danger that can be checked and prevented, "whether it be from precarious buildings or from any other source." These sentiments would find more general acceptance now than they did then. I have endeavoured to show that the existing regulations are totally insufficient, and that a more stringent remedy is required than merely tinkering-up and amending them. If I had gone more into detail I could have made my case stronger, as many of the minor provisions of the Building Act are notoriously out of date; but I have preferred to deal rather with broad, general principles. And I would ask, in conclusion, Is there any subject which this Institute—which is increasing in numbers, strength, and influence—could take up with greater propriety than that of calling public attention to the requirements of the time? I alluded to the new powers which the County Council are seeking. It is not to the powers themselves, but to the method of obtaining them that I object, though I can very well imagine that, with the vast amount of work which that body has to do, it has not yet given due attention to the reform of the Building Acts. This is essentially a matter for the Municipal Parliament to take up, nor can I doubt that if they were to prepare a really comprehensive Act, the Imperial Parliament would

give facilities for its passing; and I look forward confidently to the day—in the not far distant future—when this great metropolis shall be administered in accordance with the regulations of a model Building Act, under which it will be impossible any longer to build shoddy cottages for workmen or death-traps for shop-assistants—when the poor will no longer be permitted to herd together more like beasts than human beings —when the overcrowding of the land with houses will be prohibited, and the provision of ample open spaces enforced—when the public buildings will be such as to excite the envy of neighbouring nations—when, in a word, this London, in addition to being the largest, shall be in a fair way to become (as it easily might be) the best arranged, best built, most sanitary, and generally most magnificent city in the whole world.

JOHN SLATER.

*** The Discussion [see verbatim report in *The R.I.B.A. Journal*, Vol. VI., pp. 176–179, and pp. 191–205] of Mr. Slater's Paper * was carried on by Mr. E. C. Robins, F.S.A., Mr. Henry Dawson, Mr. Charles Fowler, Professor Kerr, Mr. Edwin T. Hall, Professor T. Roger Smith, Mr. H. H. Collins, Mr. Banister Fletcher, Mr. Lacy W. Ridge, and Mr. C. Forster Hayward, F.S.A. A brief abstract of their remarks and of the reply made by the author of the Paper is here appended:—

Mr. E. C. ROBINS, F.S.A., *Member of Council*, agreed with very much that Mr. Slater had said, and referred to the difficulties which had once arisen to himself with regard to the Registrar. In those days lithographed copies of the drawings were made, and a copy given to the architect and to the district surveyor, with written instructions for their guidance. He thought official referees would be a great advantage. With reference to the area in the rear of each house, it was impossible to lay down hard-and-fast rules; and he considered, if the competent authority indicated by Mr. Slater were obtained, a great stride towards improving the Building Act would be effected.

Mr. HENRY DAWSON, *Fellow*, protested against the power given under the 13th section of the Metropolitan Building Act, 1855, being exercised, as, although appropriate thirty years ago, it was entirely outside the gauge of present needs, and thoroughly inconsistent with, because subversive of, modern improvements. He was of opinion that any new Building Act should include a codification of the best portions of previous Acts, and be a complete Act. The first provision in a Building Act was with regard to streets, sewers, and other public requirements. Forty feet minimum width for streets he thought too narrow, as speculative builders always took advantage of the minimum, while the height of a building should surely be in proportion to the width of the streets it abutted upon. One of the chief features of a Building Act was the protection against the spread of fire. He disagreed with Mr. Slater that the restriction of the size of buildings was not desirable. There should be a most decided restriction, unless there was a provision for making the building, or the greater part of it, fire-proof. Iron doors

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* The Paper was also further discussed in *The R.I.B.A. Journal*, at pp. 205–210, and pp. 249–252, by Professor Aitchison, A.R.A., Mr. Arthur Cawston, Dr. Pearson, Mr. H. McLachlan, Mr. Alex. Payne, Mr. M. E. Macartney, B.A., Mr. Arthur Baker, Mr. C. H. Brodie, and Mr. Holden. A leading article on the subject also appeared in the *Journal* from the pen of Mr. Arthur Cates, pp. 243-248, with a note from Mr. Penrose.

in party-walls between blocks should not be so large as allowed in the present Act; each opening in the party-wall should not be more than 6 ft. wide, with lobbies, and with 14 inches of wall running from top to bottom to enclose those lobbies; while the iron doors, instead of being only 18 or 24 inches apart, should be about 7 ft. or 8 ft. apart, while the intermediate portion of each floor should be of fire-proof material. It would be very serious and arbitrary that no public building should be allowed unless it had two frontages.

Mr. CHARLES FOWLER, *Member of Council*, had always thought that building surveyors—now called district surveyors—were first appointed under the Act of Charles II. He was sure all thought that the regulation of the height of houses in streets was desirable. It was not desirable, he considered, to refer questions between adjoining owners to the district surveyor; it was better for each owner to appoint a person to represent him—they, of course, appointing an umpire, as provided under the present Act. He agreed that a special tribunal was desirable, but thought the House of Commons would object. If they did not, he suggested that a judge should be appointed, with two architects as professional assessors. Regulations giving schedules as to the thickness of joists, girders, &c., carefully framed, might no doubt be an advantage. He was afraid many people were averse to giving officials very considerable discretionary powers, but considered such powers, within moderate limits, would be of enormous advantage.

Professor KERR, *Fellow*, had always been of opinion that the Metropolitan Board (and now the County Council) ought to usurp a certain kind of authority which, strictly speaking, they might not possess, for the practical application of the Act in the public interest; and believed no one would object to the Superintending Architect being entrusted with authority to give advice and a decision on many questions of dispute, which would thus be intercepted on their way to the law courts. He compared London and Paris: in London there was very little discipline, while in Paris there was a great deal, to the advantage in certain respects of that exquisite continental city. In framing any Bill, he thought, the first point to consider was whether the House of Commons would pass it; and it was very doubtful whether the standing English principle—that every man might do as he wished with his own, provided he did not positively injure his neighbour—would be interfered with. It was therefore necessary, he considered, to bear in mind that a Building Act was for the mere safety of the public, or very little more, at the least possible amount of individual sacrifice. As an illustration of the Philistinism which enveloped English building discipline, he referred to the old tribunal of experts and the Registrar, and the present Court—a magistrate. It was not until the surveyor had made out a perfectly clear case that the magistrate showed any sympathy with him. A French magistrate under the same circumstances would take it for granted the official was right; but the English magistrate would think it quite as likely that the individual was being needlessly molested, and that it was the sacredness of property, however small, which was at stake. He had no wish to discourage intelligent endeavours after reform in building legislation, but thought, for such success as might be attainable, that the exercise of ingenuity was required, more than the expression of indignation. Measures would have to be devised which would improve the city as a public possession, without provoking such resistance, from the principle of private property, as would be supported by the public opinion of a strictly commercial people.*

Mr. EDWIN T. HALL, *Fellow*, dissented from the view that buildings and streets should be dealt with in one Act. Streets, wharves, and open spaces would be better in a separate Act; or, if in one Act with buildings, in a distinct part. He considered the minimum width of forty feet for streets was reasonable. He could not see on what principle the owner of a corner building should pay for laying out the return frontage of his building. Dealing with the question of buildings, he said the Bill brought in by Sir William Tite in 1870, to consolidate the Building Acts relating to the metropolis, contained many provisions of importance. The first great necessity in a Building Act was to have distinct definitions; this the Bill of 1870 contained. Erections on buildings for telegraphic and telephonic purposes should be under the control of district surveyors; while certain buildings, owing

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* This abstract is a combination of Professor Kerr's speech, delivered at the first discussion of Mr. Slater' Paper, and of a Paper subsequently forwarded by him to the Council, and which was read by the Chairman at the adjourned meeting. His Paper, which was most carefully prepared, is printed in full in *The R.I.B.A. Journal*, Vol. VI., pp. 194–195.

to their distance from other buildings, should be exempt from the operations of the Act. The principle of a limited maximum height for buildings was a sound one, and he considered it should be measured from the level of the public pavement nearest to the buildings to the top of the topmost storey. No limit should be fixed in respect to the cubic contents of a building, but a special consent of the County Council should be obtained for any building which exceeded 216,000 cubic feet. The construction of such buildings and of tall buildings should be subject to the approval of the district surveyor, with an appeal to a technical court. The thickness of walls should be regulated by the weight on them; and he thought in warehouses, &c., party-walls should be carried from three to four feet above the roof, which would frequently prevent fire from spreading. The limitation of areas of openings in external walls (section 13) would be ridiculously hard if carried out literally. Referring to Mr. Slater's scheme for damp-proofing a wall, a dry area was almost impracticable in London, and he (the speaker) recommended a wall, coated outside with asphalt, or lined outside by two courses of slates vertically laid, with broken joints, and at the base of the wall a horizontal damp-course of slates. The question of lifts penetrating floors was a difficult one, and must be dealt with in any new Act, and be controlled in some way to prevent the spread of fire. He agreed that district surveyors should have discretionary powers, and that a court of appeal should be established. In the Bill of 1851 the court of appeal consisted of one architect and one lawyer; in that of 1870, a special magistrate and two architects; while that of 1890 provided for one member to be nominated by the County Council, one by the Royal Institute of British Architects, and one by the Surveyors' Institution; and on those lines he thought a very admirable court might be constituted.

Professor T. ROGER SMITH, *Fellow*, concurred with Professor Kerr in suggesting moderation; it was as a safeguard against dangers which beset buildings that a Building Act had to be established, and it should not be forgotten that it had to go over a vast area and to refer to buildings of every sort. Consequently, it was necessary to make the regulations broad and to forego a certain amount of detail. He considered a Building Act ought to be definite, and protested against the doctrine that district surveyors should have increased discretionary powers, as they had to deal not only with buildings erected under the supervision of an architect, but with many more where no architect was engaged. The dispensing power had been a great evil to the Metropolitan Board, and, if increased, could hardly fail to be an evil to the County Council. The Model Bye-laws, a carefully considered emendation of the Building Act, contained many improvements upon that Act; and, though not referred to by Mr. Slater, should not be lost sight of by framers of any new Act. He concurred that an appeal court was desirable, but thought the best arrangement would be the establishment of a police magistrate *ad hoc*, with two assessors or with one, the responsibility to rest with the magistrate, and the position of advisers and experts to remain with the assessors.

Mr. H. H. COLLINS, *Fellow*, referred to Mr. Slater's remarks upon the office of district surveyor; and, in refutation of the same, said there existed a most exhaustive report as the results of the inquiry before the House of Commons on the 1874 Bill. The results of that inquiry he considered eminently satisfactory, and he quoted numerous passages of the report in support of his opinion, concluding by stating that right through the inquiry the evidence of all kinds of people was entirely in favour of the surveyors.

Mr. BANISTER FLETCHER, *Fellow*, could not see any reason why the duties of the sanitary officers of the vestry should be cast upon the district surveyor, and considered it was not possible, under the Metropolitan Building Act and the vestry sanitary regulations, to erect such buildings as were alluded to by Mr. Slater in the last paragraph of his Paper. The Model Bye-laws which had been so praised were founded on the Building Act which had been so much abused, but which he considered a good Act, well administered. As to the width of streets, he thought forty feet was sufficient in suburban roads.

Mr. LACY W. RIDGE, *Fellow*, thought that an Act might be drawn which would give district surveyors a certain amount of discretion as to the material and construction of the buildings, with an appeal from them to a technical court. He submitted there were several reasons why they could not be contented with the present Building Acts. During the last thirty-five years the conditions of building had immensely changed, and the demand for a new Act was quite justified. The Model Bye-laws were, he contended, a great improvement on the Building Act, and they included the question of drainage, which should not be omitted from any future Building Act.

Mr. C. FORSTER HAYWARD, F.S.A., *Fellow*, agreed that improvement was needed, for the Act was far from perfect. He felt very strongly that a new Act should be as definite as possible in its set rules and requirements, and that the discretionary or dispensing power should be very limited indeed. The question of the height of buildings meant also the regulation of storeys, for if the height were limited and the number of storeys not regulated, extraordinary constructions would result. What was needed, he thought, was not so much to limit the height as to control the construction. The point "Lifts through buildings" was most important. Advertisements on walls, he considered, should be controlled, as well as telegraph poles and such like erections. Over-legislation was to be deprecated, and the Act, he thought, should not go into too small details.

Mr. JOHN SLATER, B.A., *Member of Council*, in reply, said of course the Act did not permit the erection of shoddy cottages; but they were erected, owing to there being no power to properly control the materials. He thought, as Mr. Ridge had said, the time had come for a good solid Act. The evidence read out by Mr. Collins showed, he considered, that more discretion should be given to the district surveyors; more power ought to be given to them in regard to the whole question of construction of buildings. With regard to the Model Bye-laws, he had not referred to them as they did not apply to London; but they should certainly be embodied in any new Building Act. He still thought certain sites ought not to be allowed for public buildings. The great point he wished to insist upon was that a strong Act was wanted; that the various Acts and amendments at present in force should be codified and brought into one Act, and that a technical Court of Appeal should be established.

LXX.

THE GALILEE OF DURHAM CATHEDRAL: ITS NAME AND ITS NATURE. By William White, F.S.A., *Fellow*.

Mr. Arthur Cates, *Vice-President*, in the Chair.

Mr. Vice-President and Gentlemen,—

DURHAM CATHEDRAL is specially and justly celebrated for the magnificence of its situation, and for the unusual type of its Norman architecture. It is also equally celebrated for its Galilee. This Galilee is a perfectly unique structure, although its equivalent in some respects may be met with in other churches, both at home and abroad. Architecturally, the Galilee is remarkable as a specimen of late Norman work, with slender columns, thin semicircular arches, and zigzag mouldings, although the date of its erection runs almost into the first Pointed period. It is not of its architectural character that I have now to speak, but I must, in passing, point to its plan of five parallel compartments or aisles, each of four bays; and to the locality of its several altars and tombs [figs. 59, 60, and Illustns. xxx–xxxii].

The name of the Galilee is almost as well known as that of the Cathedral itself, but not so its true meaning, or the proper purposes for which it was originally erected and used. Every one seems to know it by repute, or from having seen it; but it is rare to find any one ready to give a definite explanation of what it is really. Indeed, as to this, the several and diverse traditions respecting it would point to considerable uncertainty. They are not only at variance with each other, but no one of them will account for certain architectural features found in it, or for the name which has, all along, been attached to it. The "doubts" and "probabilities" expressed regarding it indicate a lack of definite evidence. In guide-books it has commonly been called the Galilee porch, the Galilee chapel, or the Lady-Chapel. If there were any definite or reliable tradition upon which the matter might be really said to rest, one might well hesitate to suggest another interpretation as more likely. The commonly prevailing idea seems to be that it was built as a chapel, and indeed as the Lady-Chapel; but, for reasons which I shall give, I consider this view to be untenable.

Canon Greenwell, a great authority on all that relates to the history of Durham Cathedral, says—quoting from a MS. of the sixteenth century *—that "Hugh de "Puiset, or Hugh Pudsey, as he is generally called, a nephew of King Stephen, ". . . began to build what he no doubt intended to be a Lady-Chapel at "the east end of the Cathedral. He caused marble columns and bases to be "prepared for it, which came from beyond the sea;" *i.e.* not from foreign ports, but from Dorsetshire to Newcastle by sea. The work had not made much progress when cracks began to appear in the walls; "and Pudsey, thinking it was distasteful

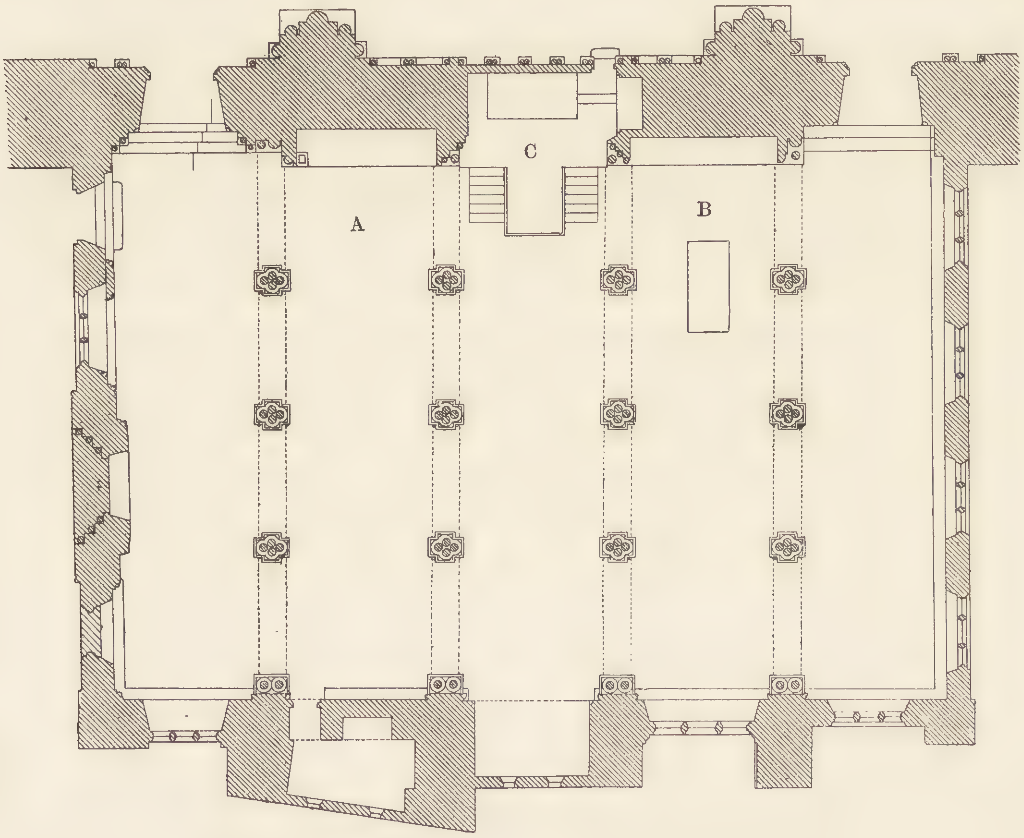

FIG. 59.—GROUND PLAN OF THE GALILEE: DURHAM CATHEDRAL.
Scale: about 17′ 6″ to an inch. A, Altar of "Our Lady of Pity." B, Tomb of Venerable Bede and Altar. C, Cardinal Langley's Tomb and Altar.

"to God and St. Cuthbert, left off building there and transferred the chapel to the "west end, where, under the name of the Galilee, it still remains." Canon Greenwell describes the Galilee as "this so unusually situated Lady-Chapel," and continues: "St.

* *Durham Cathedral: An Address delivered September* 24, 1879. By William Greenwell, M.A., F.R.S., F.S.A. 8vo. Durham, 1881. Pp. 32 *et seq.* Canon Greenwell's statements respecting the Galilee are mostly derived from a manuscript supposed to have been written in 1593, and first published in 1672 by John Davies of Kidwelly, entitled *The Ancient Rites and Monuments of the Monastical and Cathedral Church of Durham.* London. 12mo. Dr. Christopher Hunter republished extracts from this manuscript in 1733 ("printed by Ross "for Mrs. Langhorne"). In 1842 the Surtees Society printed it (vol. xv.) in a more correct form, after careful

" Cuthbert is said to have had a more than usual monastic dislike to women; and, " therefore, to have built the Lady-Chapel at the east end of the choir—the ordi-

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editing by James Raine, the Secretary to the Society; and therein the description of the Galilee, at pp. 36–40, reads as follows :—

" Wherefore the chappell dedicated in honor of Saint Mary was named and cauled the Galleley.—And " for the cumforth of all women, and solace of theire soules, there was an ancyent Church in the Ferne iland " [Lindisfarne] where the church of that towne nowe standeth, which was appoynted for women to repaire unto, " both for the hearing of masse for making there prayers, and receyving the sacraments; for which cause " there was a chappell maide and dedicated to the blessed Virgin Marie, now cauled the Galleley. Upon the " namyng wherof is to be noted, as yow may reade in the booke entituled *The Acts of the B., ca.* 26.

" Hugo, Bushop of Durham, who was consecrated in the yeare of our Lord God MCLIIII at Rome, by Pope " Athanasius, upon the feaste day of Saint Thomas the Apostle, considering the deligence of his predecessors in " buylding the Cathedrall Church, which was finished but a fewe yeres before his tyme, no Chappell being then " erected to the blessed Virgin Marie, whereunto it should be lawfull for women to have accesse, began to erect " a newe peice of woorke at the east end of the said Cathedrall Church, for which worke there weare sundry " pillers of marble stone brought from beyonde the seas; but this worke, being browght to a small height, " began throwghe great rifts apperinge in the same to fall downe, whereupon it manyfestlye appeared that " that worke was not acceptable to God, and holy Saint Cuthbert, especially by reason of the accesse which " women weare to have so near his Ferreter. In consideration wherof the worke was left of, and a newe " begun and finished at the west angle of the said Church, wherunto yt was lawfull for women to enter, having " no holie place before where they mighte have lawfull accesse unto for their cumforthe and consolation.

" In that it is called the Gallely by reason (accordinge as some thinke) of the translatinge of the same, " once begun and afterward removed, where upon it toke the name of Galleley, to which place such as maid " repaire unto it had graunted unto them sundry pardons, as more plainly appereth in a table there sett up, " conteyning the said pardons.

" Within the said Gallelei in the Cantarie, being all of most excellent blewe marble, stood our Ladies " alter . . . where our Ladies masse was sung dalie . . . wherin the first founder of the said chantarie Bushop " Langlei his soule was most devoutly praied for both in the begyning and ending therof. [Details follow.]

" Thomas Langley Bushop of Durham, lyeth buryed under a faire marble towme within the said cantaree, " before our Ladies Alter. [Details follow.]

" On the north syde of the saide Galleley was an Alter called the Lady of Pitties Alter, with her pictur " carryinge our Saviour on hir knee, as he was taiken from the crosse, a very dolorouse aspecte. [Details follow.]

" There was on the south syde, betwixt two pillers, a goodly monument, all of blew marble, the hight of a " yeard from the ground, supported with v pillers, in every corner one; and under the mydest one, and above " the said throwghe of marble pillers, did stand a second shrine to Saint Cuthbert, wherin the bones of the " holie man Saint Beede was inshrined, being accustomed to be taiken downe every festival daie, when there " was any solempe Procession, and caried with iiii Monnckes in tyme of Procession and devine service, which " being ended they did convey it into the Gallely, and sett it upon the said tumbe againe, havinge a faire cover " of wainscott verie curiously gilted and appointed to drawe up and downe over the shrine, as they list to showe " the sumptuousness therof. [Details follow.]

. . . .

" On the south syde of the said Galleley was the Alter of Saint Beede, before the which Alter lieth his " bones and reliques interred under the same place where his shrine was before exalted.

" Adjoyninge unto the lower parte of the great wyndow, in the weste end of the said Gallelee, was a faire " iron Pulpitt, with barsse of iron for one to hould them by, going up the stepes unto the pulpett, where one " of the Monncks did cume every holy day and sunday to preach, at one of the clock in the after noone.

" In the west end of the south angle was a Fonnte for baptising of children, when the realme was inter- " dicted by the Pope, which Thomas Langley, bushop of Durham, did onely procure as a priviledge, upon " speciall favour, at the Popes handes."

The names of the other authorities from whom Canon Greenwell derived information are given by him at page 17 of his Pamphlet. The first is Symeon, a monk of Durham, who lived when a great part of the work of the church was going on, and whose *History* was continued after him by an anonymous writer [*Symeonis Monachi Dunelm. libellus de exordio Dunelmensis Ecclesiæ.* Ed. Thomas Bedford, Lond. 1732.] Symeon's *History of the Church of Durham*, edited by J. H. Hinde, forms vol. li. of the publications of the Surtees Society. Then, in the Society's ninth volume, entitled *Historiæ Dunelmensis Scriptores Tres*, is a further continuation of the history of the Cathedral by Geoffrey de Coldingham, Robert de Graystanes, and William de Chambre, the three Durham historians. Besides these, Canon Greenwell states that there exist " a number of " indulgences from various Bishops, given towards obtaining means for making additions to and alterations in " the building, and a few but late fabric rolls."

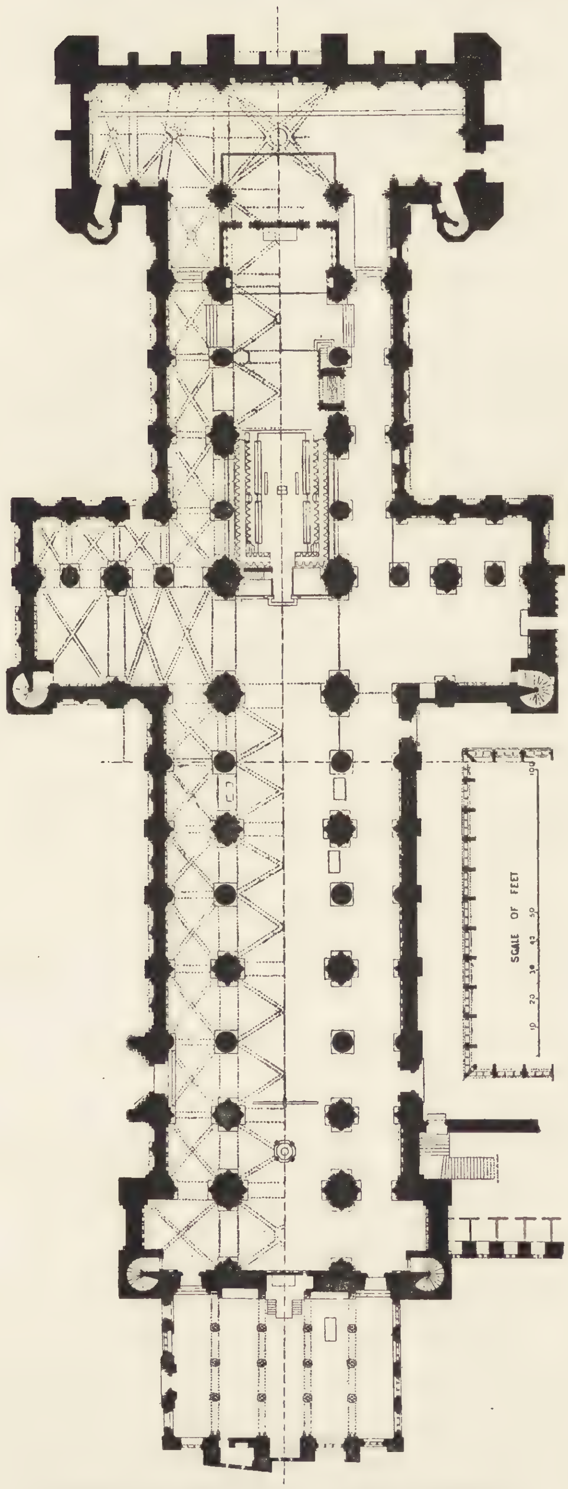

FIG. 60.—GROUND PLAN OF DURHAM CATHEDRAL.
Scale : about 67 feet to one inch.

"nary position—and close to his "shrine, would have been most "distasteful to him. No woman, "indeed, was allowed to approach "further eastward in the church "than as far as a line of dark-"coloured marble, forming a cross "by two short limbs at the centre, "which [fig. 60] stretches across "the nave between the piers just "west of the north and south doors. "The chapel of the Blessed Virgin, "commonly called the Lady-Chapel, "was therefore placed where we "now see it." Davies states that "at the West-end of the said Church "Hugo, who was also called Pudsey, "Bishop of Durham and Earl of "Northumberland, did build a very "fair and beautiful chappel which "he dedicated to the Virgin *Mary*, "and was called the *Galilee*, or our "Lady's Chappell, but now simply "called the *Consistory* [A.D. 1672]."

Gwilt, in the first edition of his *Glossary*, says that the Galilee was "A porch . . . where the monks "collected in returning from pro-"cessions, where bodies were laid "previous to interment, and where "females were allowed to see the "monks to whom they were related, "or to hear divine service."

The late Mr. W. H. D. Longstaffe, in a Paper published in the *Transactions* of the Archæological and Architectural Society of Durham and Northumberland, states that, "from whatever reason, it "was called the Galilee imme-"diately after its erection, as we "gather from the making on its

"altar, before 1186, of a charter by the lady of Ranulph de Dyttneshall to St. Cuth-"bert and Pudsey himself." He then gives his reasons for supposing that the Galilee was erected about 1175; and adds that it was no doubt used as a Consistory Court long before the Reformation. Pudsey was Bishop from 1153 to 1195.

The date given by Longstaffe for the erection of the Galilee, namely, about 1175, has been accepted as probably accurate; and it is believed that the main west entrance to the Cathedral was not closed until about 250 years after, when Cardinal Langley (who presided from 1406 to 1437) blocked it with an altar and a tomb for himself. The doorways on either side are said to have been made at the same time.

From a volume published by the Surtees Society, we learn that Cardinal Langley, having craved permission from the Pope, placed a font at the west end of the Cathedral for the baptism of children whose parents were under sentence of excommunication,—"a suitable accompaniment to the seat of consistorial judgment "hard by, from which the thunders of ecclesiastical law in those times issued almost "weekly, and from which, in cases of criminal misconduct, there was no appeal." * The building in which these sentences were thus promulgated could hardly have been recognised as a Lady-Chapel, though it might not have been inconsistent with the dedication of an altar to Our Lady of Pity, especially if it could be shown that it was the place where the parents themselves had been subjected to the pains and penalties of excommunication.

Then, again, we read that a chapel was dedicated to the Virgin Mary, now called the Galilee, upon the naming whereof is to be noted, as may be read in the *Acts of the Bishops*; and that it is called the Galilee, as some think, by reason of the translation thereof, being once begun and afterwards removed, whereupon it took the name of Galilee.† But not a syllable is said to justify this crude supposition, whether by way of reason or of etymology, as to how or why "Galilee" should or could be derived from such "removal." It is further stated that in the north side of the Galilee was dedicated an altar, called the Lady of Pity Altar, with her picture carrying the dead Saviour on her knee.† But what could the name "Galilee" have to do with a chapel of any sort, supposing Pudsey really to have intended the building for such special purpose?

Let us look for a moment at the origin and meaning of the word "Galilee." It was the Hebrew word for "Circuit," and it was originally applied to the circuit of the country around Kedesh Naphthali, containing the twenty towns which were given by Solomon to Hiram, King of Tyre, as payment for his work in conveying timber from Lebanon for building the Temple at Jerusalem. Being occupied chiefly by strangers, the district was called "Galilee of the Gentiles." The outer court of the Temple at Jerusalem was designated the Court of the Gentiles. Into this court were admitted Galileans, strangers, and proselytes, who were not admitted into the Temple itself. And we shall see presently it is much more likely that the name of the Galilee at Durham,

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* Raine's *Brief Account of Durham Cathedral*, page 84. † See footnote, page 143 *ante*.

which was sometimes denominated "Galilee of the Gentiles," took its rise from the association of ideas and circumstances, being a court, not for worship, but for the judicial hearing of causes external to the courts of the Church.

It is recorded by Gervase of Canterbury that in his day, when a female relative came to the college to see a monk, she was directed to the porch of the church with words of Scripture: "Behold he goeth before you into Galilee, there shall you see "him." And this is held by some to be the most likely origin of the name, instead of being, as I think it was, merely a mediæval play upon the name, which, almost certainly, was given prior to such use of it. Gervase was contemporary with Pudsey.

Of the probabilities and uncertainties as to its origin, its use, and its name, what shall we take as the most likely true interpretation? My belief is that Pudsey built the Galilee in order to provide a suitable building as a court external to the Cathedral, though in contiguity to it, to serve not only for his Palatine Court, but also for his Regal Court of Justice. Many cases both criminal and civil necessarily came before him as Prince Bishop; and in his hands was the power even of life and death, without appeal to the Crown or any other authority. But besides these there would be causes brought before him, as Chief Justiciary, when King Richard I. went his crusade to the Holy Land; and Pudsey was a man likely to make all the display of authority which lay in his power. Whatever may have been his pretensions or his professions, he was much more likely to do something which should serve his own ambition than to provide a religious sanctuary for the weaker sex. Here he would display the symbols of his twofold power, and jurisdiction. He would rarely, if ever, sit as a judge in his own person. But on either side of the seat of judgment he would have portrayed the King and himself officially vested, as representing his regal, as well as his own princely, authority conveyed to the jurisdiction of the judges appointed by himself to act in the King's name as well as in his own.

It is recorded of Bishop Pudsey that, when King Richard I. was preparing to lead an army to the Holy Land, he took upon himself a vow to join him; and for this purpose he is said to have raised large sums of money. The King, fearing lest Pudsey should overshadow him by the magnificence of his preparations and retinue, persuaded Pudsey to let him have the money, in consideration of Pudsey being made Earl of Northumberland. Pudsey thereupon obtained dispensation from his vow, when the King made him likewise Chancellor and Chief Justiciary for the whole of England. But in consequence of his ambitious designs and unscrupulous mode of prosecuting them, the King before leaving England divided the country between two Regents, whom he also made Chief Justiciaries; still appointing Pudsey for all the country lying north of the Trent, and Longchamp, Bishop of Ely (1189–97), for the south; the latter being made also Chancellor and Pope's Legate. There was, however, a constant feud and much rivalry between these two Bishops; and afterwards, when Pudsey's honours were taken from him, they were conferred upon Longchamp, who, in his turn, was left in supreme authority by the King.

As to the name and nature of the Galilee we have a further noticeable fact,

some may call it a mere coincidence. Although there are, or were, in England several so-called Galilee porches, there is really but one besides Durham which has been generally recognised as a "Galilee." This is at Ely; and, as we have seen, Ely was the seat of another Prince Bishop, who was also the King's Regent and Chief Justiciary. At Ely the Galilee is a porch built upon an unusually large scale. According to one account it was built, not by Longchamp, but by his successor, Bishop Eustachius, also Chancellor of England and Dean of Sarum, who was elected to the See in 1197 and presided until his death in 1215. Millers, in his account of Ely Cathedral,* says that Eustachius erected a building called the Galilee below or near the west tower; and although it is supposed there was here a previous building on a smaller scale built by Longchamp, this is the building always supposed to have borne that name. He goes on to say that there were stone benches against the walls of this building where penitents used to sit awaiting their re-admission into the church. Here also probably they had already received their sentences of excommunication. According to Bentham, this Galilee was built about 1200, so that it would be one of the Bishop's first important undertakings. But Stewart says that, comparing it with work which he is known to have built, Eustace can have had nothing to do with the erection of any part of the present Cathedral, that his Galilee has totally disappeared, and the porch which has gone by his name of late years must have been built by some unknown benefactor, portions of the older work having been incorporated into the new. The roof of the Galilee is a modern one of low pitch. It rose formerly to the floor of the lowest gallery in the tower, "and enclosed a room over the porch vault, which "was entered from the south by a staircase which has been cleared away."

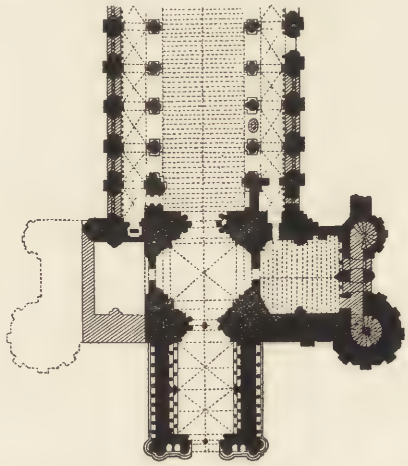


Fig. 61.—The Galilee of Ely Cathedral.
Scale: about 100 feet to one inch.
(From Dugdale's *Monasticon Anglicanum.*)

This remarkably rich specimen of Early Pointed work consists of two storeys. This being the main entrance to the Cathedral, the court must have been held in the upper storey. I am told that I am utterly mistaken, and that it is most unlikely anything in the form of such a court would ever be held in any part of a cathedral. That it was not customary to hold such courts in a cathedral, or to hold secular and ecclesiastical courts in the same place, may be quite true. But in these two cases we have special circumstances, and very special personages concerned in carrying out things in their own way; and I confess I cannot see any other probable, not to say possible, explanation than that which I have given of what we find here.

The prominent feature architecturally which first led to my forming the con-

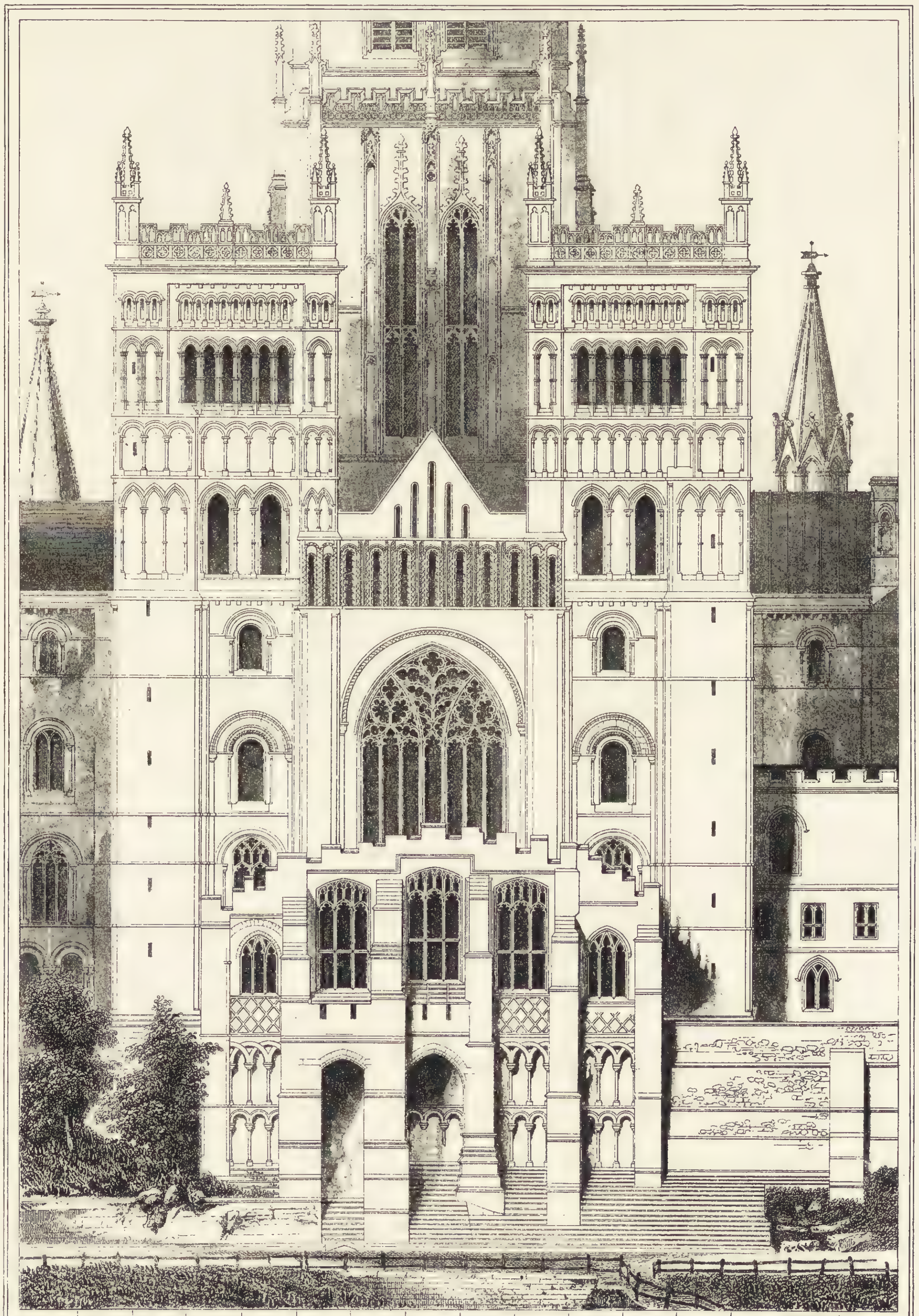
* *A Description of the Cathedral Church at Ely*, &c., Lond. 1834, page 40.

clusions laid before you, was the recess * [fig. 59, A] already spoken of in the east wall of the Galilee at Durham, between the great central portal and that of the north aisle, abutting on the nave arcade. The back of the recess has commonly been called the original reredos of the altar, dedicated when the Galilee itself was built. The painting is, as I have already said, original, but cannot be of an altar reredos. The wall to which the present altar is attached does not at all look as if it were arranged or prepared to receive such an appendage. The arch itself is of Pudsey's time, and its treatment is such as might be consistent, at that date, with forming a recess for a seat or tribunal. The altar was not dedicated till the fifteenth century; and, except the altar of the Venerable Bede in the corresponding aisle on the south,—although subsequently there were no less than sixteen altars here,—there can be no reason to suppose that any altar within the Galilee was dedicated before that time, when Langley dedicated the altar for his own tomb to the Blessed Virgin. Across the spring of the arch is a band of ornamental colour forming the head of a painted drapery pattern. Then come the paintings of the King and the Bishop on the return jamb, north and south of the recess. A large circle above the arch was occupied with a subject unknown, but supposed to have been a representation of the "Majesty" or Session of Christ, but rather, I should think, of the Last Judgment, which would be more consonant with its treatment—a subject fitly chosen to indicate the earthly tribunal. The central division of the reredos itself is left with its rough plaster uncoloured, as it might be for a panel picture.

This would hardly be the treatment of an altar reredos at that period. It might well be the treatment for a canopied seat, as shown in a somewhat similar instance, in the church of Old St. James at Dover.

In the east wall of a transeptal annexe (not properly an aisle), on the south of the chancel of this church, are three arched recesses [figs. 62, 63]. The central recess is placed considerably higher than the others, and across this was a band of colour at the height of the springing, the feet of the Ascending Saviour being represented in the upper part of the tympanum, whilst below the band the wall was diapered with a rose and a star alternately, introduced in the rectangular outline blockings, common for several centuries in the Middle Ages. When I first saw it there still remained the original iron hook to receive the dorsal hanging used upon official occasions. Whether built for the purpose or not, it was in this building that the Lord Warden (the Lord High Warden as he is called locally) of Dover Castle, or, more properly, the Lord Warden of the Cinque Ports and Constable of Dover Castle, is known to have held his court through the Middle Ages. When I visited this church some twenty years ago, these recesses had just been opened out, the building being in the course of

* This arched recess may be seen in Illustn. xxxi. An engraving of it forms a title-page to John Carter's *Cathedral Church of Durham.* Fo. Lond. 1801. The fretwork of the arch is described by Raine [*Brief Account of Durham Cathedral,* p. 76] as "coloured with white and vermilion, much of which still "remains." Full-length figures are painted on each jamb or reveal of the arched recess; and "these, a king "and a bishop, probably Richard I. and Pudsey himself, are still [A.D. 1833] in a good state of preservation."



From Billings' "Cathedral Church at Durham"

C. F. KELL PHOTO-LITHO. 8. FURNIVAL ST HOLBORN E.C.

THE WEST FRONT OF DURHAM CATHEDRAL.

[see page 143.]

LXX. THE GALILEE OF DURHAM CATHEDRAL: ITS NAME & NATURE. (xxxi.)

From Billings' Cathedral Church at Durham. THO. B. FURNIVAL ST. HOLBORN E.C.

THE GALILEE OF DURHAM CATHEDRAL, LOOKING EAST.

[See pp. 145 and 148.]

From Billings "Cathedral Church at Durham"

PHOTO-LITHO. 8, FURNIVAL ST HOLBORN E.C.

THE GALILEE OF DURHAM CATHEDRAL, FROM THE NORTH WEST CORNER.

[see page 143]

conversion to the purposes of a public vestry-room; and on visiting it again two or three years later I found, to my sorrow and indignation, that all traces of the original treatment, instead of being conserved or restored, had been covered with

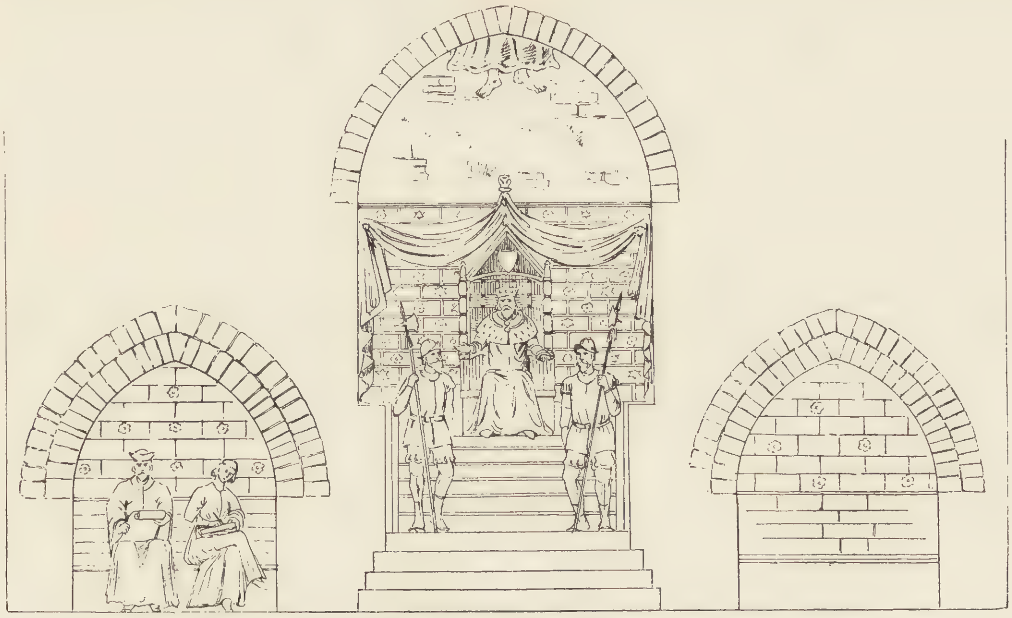


Fig. 62.—Church of "Old St. James," Dover: Transeptal Chancel Aisle. Court of the Lord Warden.

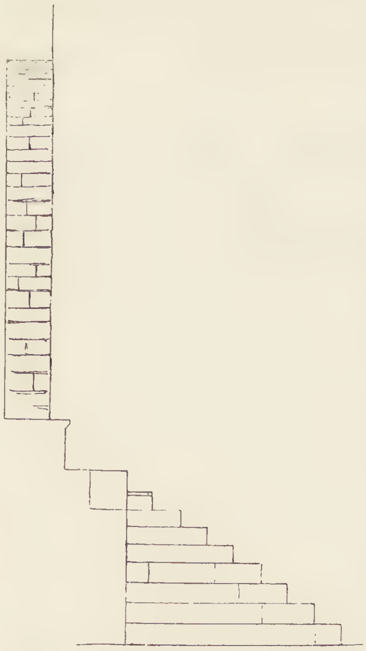


Fig. 63.—Section through Centre Arch of the above.

compo and completely obliterated. On my previous visit I was happily just in time to see them, and to preserve a record of them. This building is of Early Pointed date, somewhat later, therefore, than Pudsey's work. Its floor is some four or five feet lower than that of the chancel. It was originally twenty-seven feet wide, but was somewhat reduced by the rebuilding of the chancel. I understand there is an early engraving in existence, though I have not seen it, representing the holding of the Palatine Court in Chester Castle, in some such form as I have suggested in the illustrations of the court in the church at Dover [figs. 62, 63].

It is true that the term "Galilee" has been given in several instances to a building attached to the westward of a cathedral or church, as it has been, for instance, to the "library" beneath the central arch of the façade of Peterborough, or to the porch on the west side of the south end of the

western transept of Lincoln. In the 34th of Henry III. a Galilee is mentioned at the west end of the new chapel at Windsor [Turner's *Domestic Architecture*, 2nd ed. 1877, I. 223], and at the west front of St. Stephen's Chapel, Westminster [*Vet. Mon.*, 1842, pl. 26]. Pudsey had some connection with Windsor as Governor of the Castle, and with Westminster as Chancellor of England. The references relate to a building to the west of the church. Whether, in the first instance, Galilees were built and used as courts or not, Raine * states that "The Consistory Court, held upon the tomb of "Langley until the Reformation, was afterwards removed into the south aisle of the "Galilee," where it appears to have remained until 1794. During the present century this Galilee has again from time to time been used for the Consistory Court; and that it was formerly used as such is sufficiently indicated by the inscription in black-letter on the east wall of the Galilee over the old central doorway: "Judicium "Jehovæ est. Domine Deus da servo tuo cor intelligens ut judicet populu' tuu' et "discernat inter bonu' et malum." Such a text as this, and in such a position, would alone be quite enough to denote its use. This text may be of later date than Langley's time. It may, indeed, have been put up when the court was transferred to the west end, in which case it would be perpetually before the eyes of the judge, who sat immediately facing it. The use of the Galilee for the Regal Court would necessarily cease with the cessation of Pudsey's Regal prerogatives; but for the Palatine Court its use might well still continue till the time came when the privileges and powers of the Palatinate were merged in the Crown, and the court became assimilated to the ordinary courts of assize in other counties; when also the Bishop's powers became limited almost to the nomination of the judges of assize. Most of the Palatine privileges and powers were swept away by Henry VIII. How early the Galilee may have been used for the Consistory Court is not known.

If I am asked for authority or precedent in support of my view, I can only say that the circumstances, like the building itself, are absolutely unique, and I *can* know of no precedent or similar instance, except Durham and Ely, of a Prince Bishop acting as the King's Regent in his absence from the kingdom; and although there are many instances of a King and a Bishop being represented in sculpture, I do not know of any instance in which the King and the Bishop are in this manner represented on either side of an *altar* reredos; nor could I understand it if such a case were produced. I can quite well understand their being painted on either side of the dorsal of a throne, occupied in turns by judges exercising, as the case might be, royal or palatinal jurisdiction. Surely, under such circumstances, I have some justification in supposing that the building itself, which contains these coeval paintings, as representative of the princedom of the Crown, really was erected for the purpose of such a court of judicature.

In several village churches in England there is at the west end a porch or hall, external to the church, which, by some, has been called a Galilee. It does not appear for what purpose these halls were erected. Their purpose has never been deter-

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* Raine's *Brief Account of Durham Cathedral*, p. 85.

mined very definitely, and I cannot help thinking that they likewise may have been built for the purposes of a court. The Manorial Courts, to which submission was yearly made, and fealties were paid by tenants, must have required some recognised public place for the transaction of the business. Perhaps, however, it was only certain rectorial or monastic manors that would be thus provided for. A provision analogous to that of the Galilee would here find its fitting place. Of these projections there may be named:—the west front of Melton Mowbray Church; Snettisham, in Norfolk [illustrated in Cotman's Etchings, 1818]; Wiggington, Bucks; and Croyland Abbey. But, besides these external western buildings, there was, in many other churches, a small hall called a parvise* over the north or south porch, the purpose of which is equally uncertain and undetermined. May not this have been intended to serve a similar purpose?

At Vézelay there is such a vestibule, which, according to Viollet-le-Duc, is a veritable church with a triforium. This triforium, he says, returns over the entrance door to the nave interior, and becomes a *tribune*, or gallery, upon which an altar was placed in the twelfth century in the central niche forming originally one of the bays lighting the western gable [figs. 65, 66]. His words are: "Le "narthex [fig. 64, A B] de Cluny "datait des premières années du xiii^{e} "siècle, ceux de la Charité-sur-Loire "et de Vézelay ont été bâtis au xii^{e}. "À Vézelay, cependant, il existait un

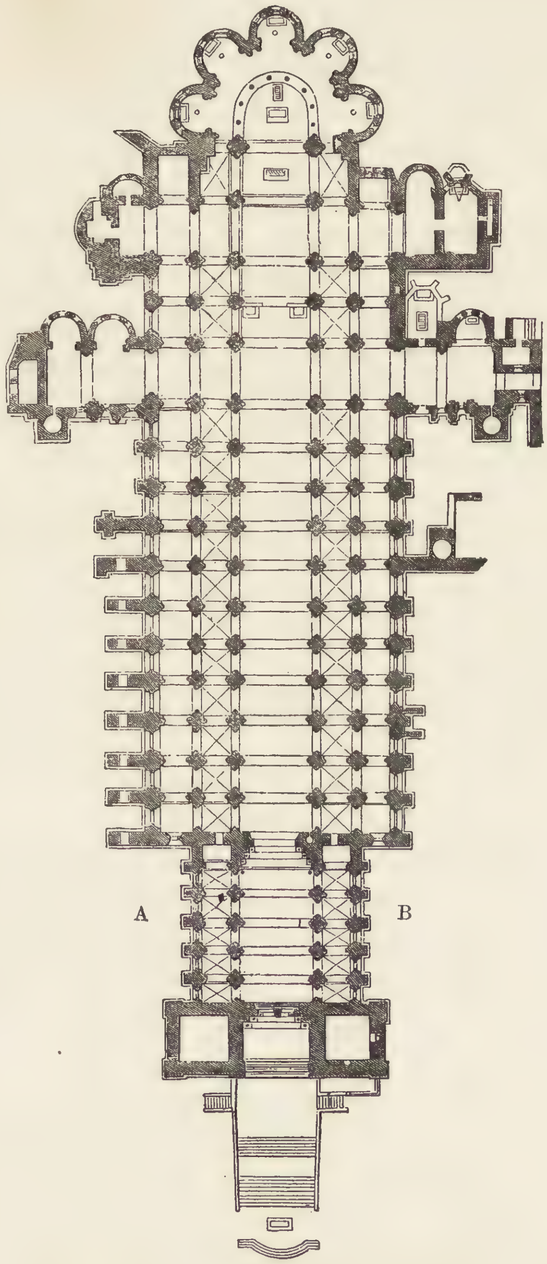

FIG. 64.—CLUNY ABBEY CHURCH (now destroyed).
(From Lorain's *Essai Historique*, ed. 1839).

* According to the interpretation which obtains in England, a "parvise" (supposed to be an abbreviation of *paradisus*) is a room over the porch of a church; but that is not the meaning of *parvis* as applied in France. It is the open space, bounded by a dwarf wall, or inclosed in some fashion, in front of the western

"porche construit en même temps que la nef, à la fin du xi[e] siècle ou au commence-"ment du xii[e], mais il était bas et peu profond. Il est difficile de savoir exactement "à quel usage cette avant-nef était destinée ; une nécessité absolue avait dû forcer les "religieux de la règle de Cluny, vers le milieu du xii[e] siècle, d'adopter cette disposition, "car elle se développe tout à coup, et prend une grande importance. À Cluny, à la "Charité, à Vézelay, le narthex est une véritable église avec ses collatéraux, son tri-"forium, ses deux tours. À Vézelay, le triforium se retourne au-dessus de la porte "d'entrée de la nef intérieure, et devient ainsi une véritable tribune sur laquelle avait "été placé un autel au xii[e] siècle dans la niche centrale formant originairement l'une "des baies éclairant le pignon occidental. Ce vestibule était-il destiné à contenir la "suite des nobles visiteurs qui étaient reçus par les moines, ou les nombreux pèlerins "qui se rendaient à l'abbaye à certaines époques de l'année? Était-il un narthex "réservé pour les pénitents? Cette dernière hypothèse nous paraîtrait la plus vrai-"semblable; un texte vient l'appuyer; dans l'ancien pontifical de Châlon-sur-Saône, "si voisin de Cluny, on lisait: 'Dans quelques églises le prêtre, par ordre de l'évêque, "'célèbre la messe sur un autel très-rapproché des portes du temple, pour les pénitents "'placés devant le portail de l'église.' * À Cluny même, près la porte d'entrée à gauche, "dans le vestibule, on voyait encore, avant la révolution, une table de pierre de quatre "pieds de long sur deux pieds et demi de large, qui pouvait passer pour un autel "du xii[e] siècle" [*Dictionnaire*, vol. i. page 259]. The stone table at Cluny, which, as it appears, was not quite like an altar, though it "might pass for such," may very well have been a permanent writing-table for the execution of documents relating to the judgments there decreed. At any rate, it would appear that such buildings had some connection with the presence and re-admission of penitents, whether they had with trials and condemnations or not.

WILLIAM WHITE, F.S.A.

⁂ The Discussion [see verbatim report in *The R.I.B.A. Journal*, Vol. VI., pp. 240–41] was carried on by Mr. S. J. Nicholl, Mr. Thomas Blashill, and Mr. T. J. Willson. A brief abstract of their remarks and of the reply made by the author of the Paper is here appended :—

Mr. S. J. NICHOLL, *Associate*, said that he remembered a similar instance, which Mr. White had not mentioned, at the Cathedral Church of Tuam, where there was a small structure which he believed was used as a Consistory Court [see Mr. Nicholl's notes on page 164].

Mr. THOMAS BLASHILL, *Member of Council*, said that he had no doubt that this building at Durham called the Galilee, which was of the latter part of the twelfth century, had been originally

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portals of a cathedral. Viollet-le-Duc [*Dictionnaire*, vol. vii. pp. 52–53] gives sketches of the *parvis* of Reims Cathedral, and of that of the Abbey Church of Sainte-Radegonde, Poitiers.

* See the original Latin, and an English translation of it, more literally rendered, on p. 163.

built for no other purpose than a Lady-Chapel. At the east end of the Cathedral, as in all other large buildings of the kind, there was a small chapel dedicated to the Virgin Mary and used only by members of the community; towards the close of the twelfth century, when the services offered with special reference to the Virgin Mary became so popular, the people, especially the women, who were not allowed to go through the Cathedral, desired to enjoy the privilege of attending them. Hence the erection of the Galilee to meet this want. Afterwards, in the thirteenth century, when the Chapel of the Nine Altars, at the east end of the Cathedral, was in use, that chapel probably fulfilled the purposes of a Lady-Chapel; the Galilee might then be devoted principally to the purposes of a Consistory Court. He (the speaker) was also familiar with the Church of Old St. James, Dover, which had been referred to by the author of the Paper. The east side of the south transept was used as the Court of the Lord Warden, but it was not so used originally; it was a purely ecclesiastical building, as might be seen from marks on the structure, and it was only in comparatively late times that it became used for secular purposes. In support of his opinion that the Galilee of Durham Cathedral was originally intended for a Lady-Chapel, Mr. Blashill stated that at Worksop Abbey, on the south side of the choir, there was a large chapel older than that Galilee, intended for a Lady-Chapel for the use of the laity; another building, at Glastonbury, similarly placed—the Chapel of St. Joseph of Arimathea—had all the appearance of a Lady-Chapel. At Ely there was a chapel on the left side of the choir, and at Bristol, one called the Elder Lady-Chapel, which was placed on the north side of the Cathedral. But at Hereford, Worcester, and many other places, arrangements were made by which people could go along the aisle furthest from the monastic buildings and thus get to the Lady-Chapel, which in the thirteenth century and afterwards was generally made to project at the east end.

Mr. T. J. WILLSON, *Associate*, considered that there were divers and simultaneous uses for such a building as that at the west end of Durham Cathedral: it was a chapel; a place of access for the laity and conveniently placed for the female sex; and, moreover, a court for the hearing of ecclesiastical causes. Such courts were removed from place to place, as circumstances dictated; and not many years ago he had been present when a cause was determined at the west end of the nave of Ripon Minster, in the north aisle.

Mr. WILLIAM WHITE, F.S.A., *Fellow*, had no doubt that such buildings were used for many purposes, and it was certain that the Consistorial Court was moved to various parts of a Cathedral; but a secular or civil court would not be held inside a Cathedral. Bishop Pudsey required a place in which to hold his secular and civil court—to try murderers, thieves, and others who could not be brought into a Cathedral; and therefore he erected this building, this Galilee, for the purpose. Palatine courts had existed from the time of Charlemagne, and at the Church of Aix-la-Chapelle, which was built by him, there is a sort of Galilee at the west end.*

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* The author of this Paper, though he has referred to the porches or, rather, ante-naves of the Abbeys of Cluny and Vézelay, does not appear to admit that the so-called Galilee at Durham may, in the twelfth century, have formed part of the orthodox or systematic arrangement of churches pertaining to Abbeys of the Benedictine Order. As a matter of fact, many of the Abbey Churches of France, during the earlier half of the twelfth century, were provided with western porches which generally consisted of two storeys. One of the oldest of the Cluniac branch of the Benedictine Order, that of the Church of Tournus, is shown in plan and section under the article "Porche" of Viollet-le-Duc's *Dictionnaire* [vol. vii. pp. 262–3]. Measured externally, this closed porch projects more than sixty-five feet from the nave entrance, and its width is more than fifty-two feet. It is divided longitudinally by huge circular piers into three divisions, and the entrance to the central division lies between two towers. Drawings of the whole building, from measurements taken by the late M. Questel, published in the *Archives des Monuments Historiques* of France, are well worthy the attention of those who are interested in this subject.

The ante-nave, erected about 1220, of the Abbey Church of Cluny [fig. 64] measured, internally, about 90 feet by 70 feet [Lorain's *Essai* (1839), p. 345]. The ante-nave of the Cluniac Church of Vézelay [fig. 65] is about eighty feet wide, and seventy feet from west to east. It is a work of the twelfth century, erected, according to Viollet-le-Duc, about 1130–40; it has early pointed arches [fig. 66], and to all appearance is later than the main body of the nave, which is round-arched and Romanesque, or, as it is still sometimes called, "Norman" in style. The Cluniac Church of Charité-sur-Loire had an ante-nave as large as that of the mother Church of Cluny; it was erected during the latter half of the twelfth century. The Abbey Church of Saint-Denis, just outside Paris, had a vast ante-nave or narthex, open on the side of the nave and closed towards the west, with a vaulted hall over, dating from 1140.

Another dependency of Cluny, the Church of Paray-le-Monial [figs. 67, 68, 69], not far from Autun, possesses a porch of two storeys, flanked by towers, of a date anterior to that of the church itself, which is of the twelfth century. One of the most remarkable two-storeyed porches in France is that of the Abbey Church of Moissac, erected about the middle of the twelfth century; Viollet-le-Duc has described and illustrated it [*Dictionnaire*, vol. vii. pp. 289–92]. A porch under the western tower of Saint-Séverin, at Bordeaux, dates from the early part of the same century.

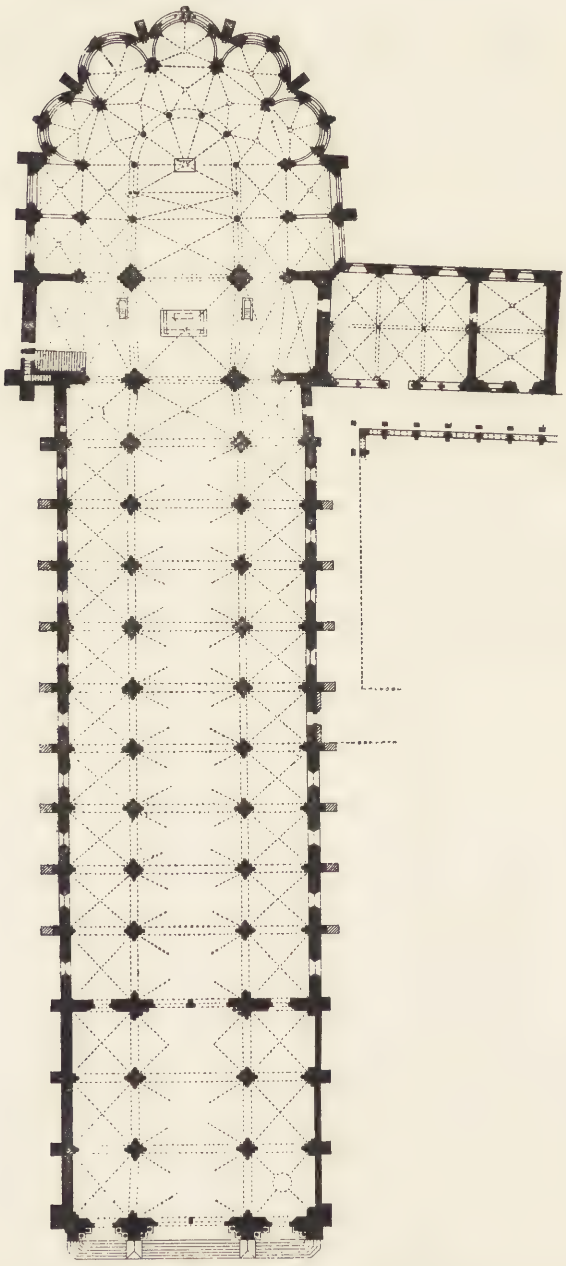

FIG. 65.—PLAN OF THE ABBEY CHURCH OF VÉZELAY.
Scale: about 67 feet to an inch.

(Reduced from the *Archives des Monuments Historiques*).

The Church of the Cistercian Abbey of Pontigny [fig. 70, p. 158], which was erected about the same period, also had a western porch, but one of an extremely simple character, a little more than thirty-three feet wide by about twenty-seven feet deep. It was to this Abbey that Thomas-à-Becket fled in 1164, remaining there until 1170, when he returned to England to resume his duties as Primate; it was here that Stephen Langton, Archbishop of Canterbury, found an asylum from 1208 to 1213; it was here that Edmond Rich, another Primate of England, died in 1242, and was buried in the Sanctuary; here also an Archbishop of York died in 1272, and was buried,—circumstances which help to emphasize the fact that ecclesiastical England, at least prior to the fourteenth century, was only a portion, and an inconsiderable portion, of the great religious organisation of Western Europe.

Again, a porch, erected early in the thirteenth century in the Cistercian manner, exists—so wrote Viollet-le-Duc in 1864—at Moutier, in the Department of the Yonne; and another in front of the Church of Toury, in the Department of the Loiret, erected about 1230. The latter is less than fourteen feet deep measured internally, and about sixty-five feet in width, occupying almost the entire width of the church front; and it thus resembles the porch or Galilee believed to have existed at Fountains, in Yorkshire, which was also an Abbey of the Cistercian Order. The late Earl de Grey, K.G., *President*, writing from Ripon about the excavations at Fountains, 16th February 1854 [TRANSACTIONS, 1853–54, page 132], stated: "The most "curious discovery of all is the existence of "a 'Galilee' or west porch. To our astonish-"ment, we found that this porch had occupied "the whole breadth of the west front (70 ft.). "I suspect, from the remains of the archi-"tectural fragments, that it had a series "of interlacing arches, with double shafts, "and that this arcade was always open to the "air." This Galilee was not more than fifteen feet in depth from west to east; and, from the fragments discovered, it would seem to have been erected about 1170–80, the date of the nave to which it led being about 1140–56.

Viollet-le-Duc, in his *Dictionnaire* [vol. i. pp. 275–76, figs. 12–14], states that the Cathedral of Autun was hardly finished when, about 1140, a vast porch was commenced against its western front; he gives two plans and a section of it—this porch having possessed an upper storey of a remarkable character. He further [pp. 279–81, figs. 15–17] gives the carriage porch of the Church of Châtel-Montagne, in the Department of the Allier, which is a Romanesque work of the plainest description, though its date is about 1130. This porch is of two storeys, and in section is a continuation of the nave westward. The storey, or rather gallery, over the porch is open to the nave, and is approached by an open flight of stone steps, placed in the south aisle against the wall. He also gives, on page 288 following, the plan and section of the porch of the Church of Créteil, near Paris. This porch, which is a Romanesque work of the latter half of the eleventh century, has been either considerably altered of late, or has disappeared. Further, the tower of the Church of Saint-Savin, near Poitiers, covers a porch of the eleventh century, the interior of which is decorated with paintings; and the western tower of the Collegiate Church of Poissy, near Saint-Germain, is erected over a porch of the same date. A plan of the two-storeyed porch of the Church of Notre-Dame, Dijon, a remarkable work of the thirteenth century, is given on page 286 of the same volume.

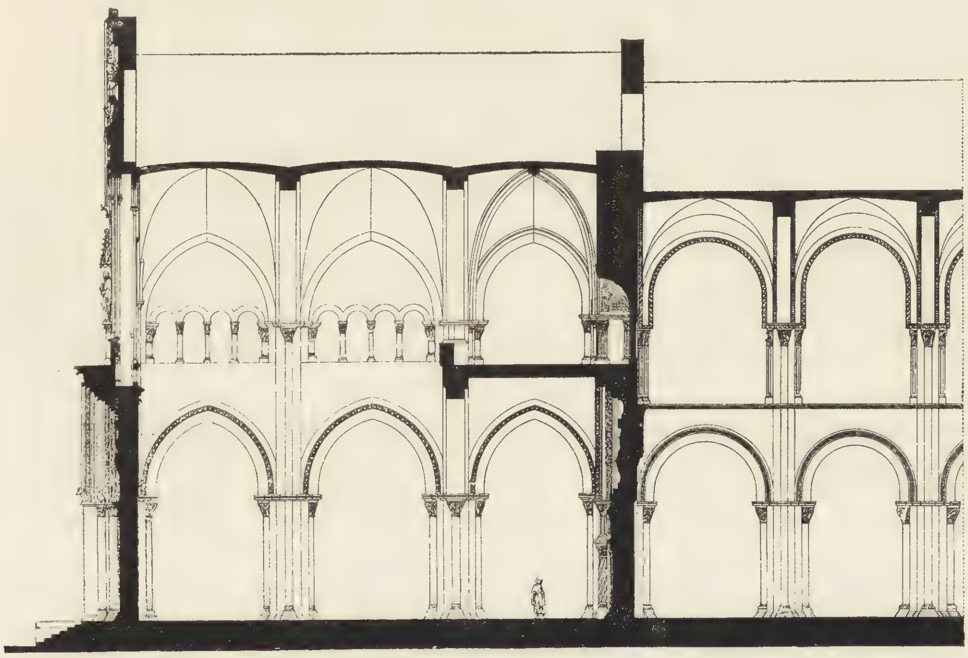

Fig. 66.—Section through the Abbey Church of Vézelay: Ante-Nave and Part of Nave.

(Reduced from the *Archives des Monuments Historiques*).

A book which is not sufficiently studied at the present day—its excellence was eclipsed by the brilliant and more technically-learned works of Viollet-le-Duc—namely, the *Abécédaire ou Rudiment d'Archéologie*, by the late M. de Caumont, contains, in the volume devoted to "Architecture Religieuse," a series of articles on the Plans of Churches; each chapter of the volume commences with a dissertation, which is well illustrated, on the "Forme des églises." Starting with the early Romanesque, he shows how "Primitivement "les églises chrétiennes ont été calquées [traced] sur les basiliques romaines"; how the *tribuna* once occupied by the judges became the throne of the bishop or the place of the officiating priest; how the portion of the nave once reserved for the advocates was taken by the singers and choristers; how the altar was placed between them and the tribuna; and how, at the further or opposite end, the faithful congregated. Again, these basilicas generally opened into a forum, which became the atrium or parvis of the newly-adapted church; and thus the earlier divisions of the Jewish temple were perpetuated—as is well described in another learned book, now little consulted, namely, the *Histoire de l'Architecture*, by the late M. Daniel Ramée. He shows how Christian society was early divided into three distinct castes: (1) the priesthood; (2) the faithful; and (3) the catechumens, who respectively occupied (1) the *lieu très-saint*; (2) the *lieu saint*; and (3) the *porche* and the *cours*.

The Church of San-Clemente, at Rome, retains such an arrangement almost in its primitive form, and it

appears to have been erected in the fourth or fifth century. "It is one of the few [Fergusson's *History of* "*Architecture* (1874), vol. i. p. 408] that still possess an atrium or courtyard in front of the principal "entrance, though there can be but little doubt that this was considered at that early age a most important, if

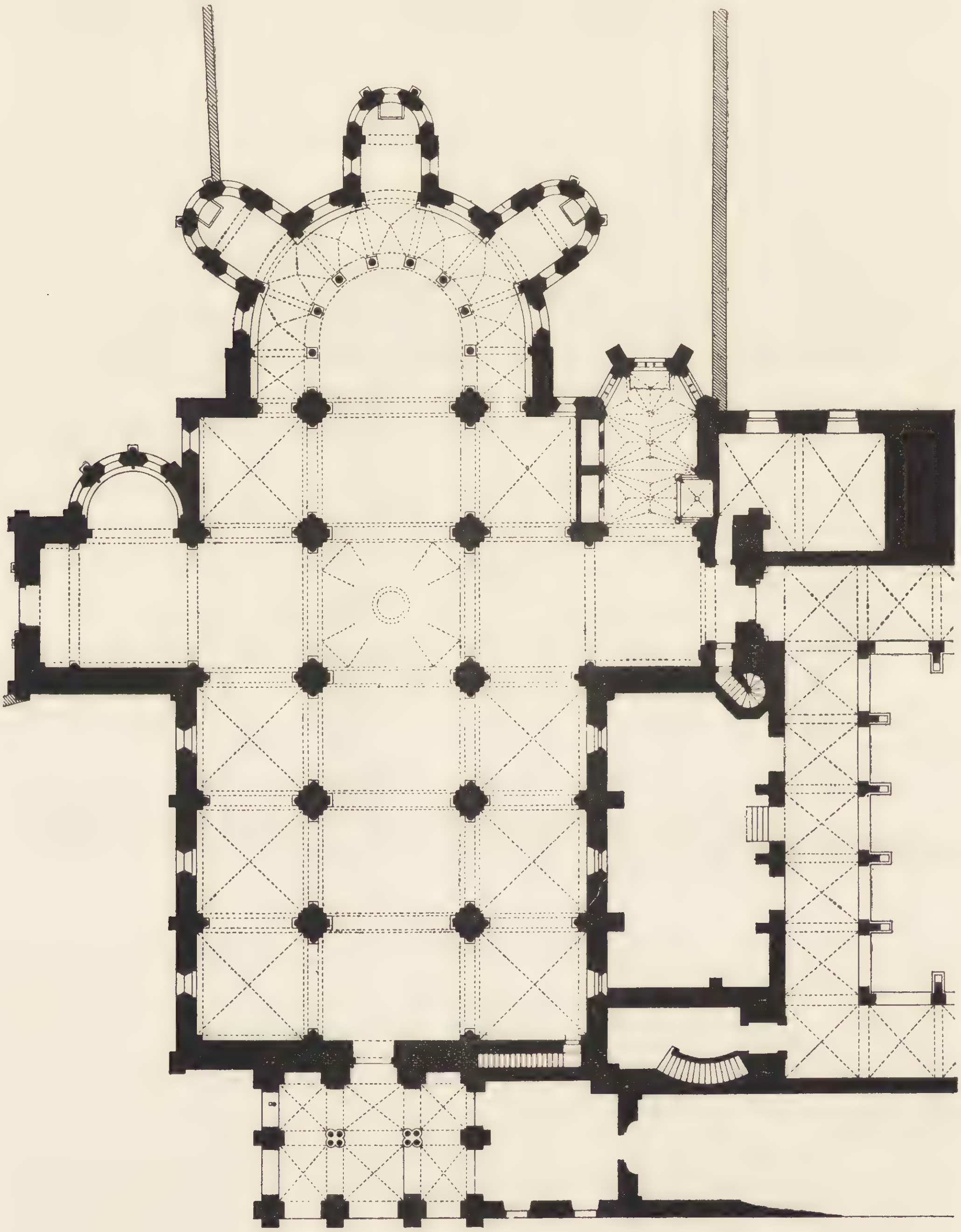

FIG. 67.—PLAN OF THE CHURCH OF PARAY-LE-MONIAL, NEAR AUTUN.
Scale : about 35 feet to an inch.
(Reduced from the *Archives des Monuments Historiques*).

" not indeed an indispensable, attribute to the church itself." He adds, on the subsequent page: " The choir, " with its two pulpits, is shown in the plan. . . . The railing of the *bema*, or presbytery [the *tribuna* of the " basilica], is also marked, so is the position of the altar with its canopy supported on four pillars, and " behind that the throne of the bishop, with the seats of the inferior clergy surrounding the apse on either " side " [fig. 71].

Two basilica-shaped churches still exist in Ravenna: that of San-Apollinare-Nuovo, erected in the time of the Gothic King Theodoric (493–526), and that of San-Apollinare-in-Classe, now called San-Martino-in-Cielo-d'Oro, which was built about the middle of the sixth century. Each possesses a narthex: the former is an open colonnaded portico [fig. 72]; the latter a closed porch of relatively considerable dimensions. Another basilican church, erected about the same period at Parenzo, in Istria, still exists, as shown in the diagram [fig. 73]. There is the atrium open to the sky in the middle, separating the baptistery on the western

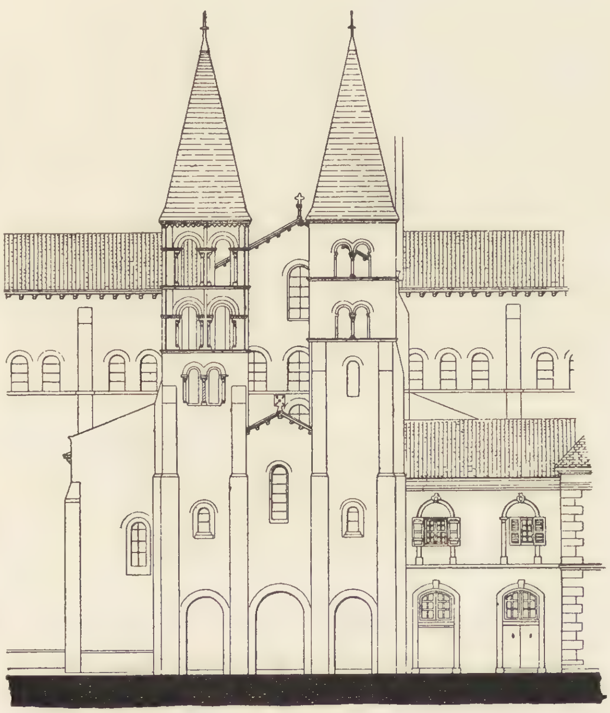

Fig. 68.—West elevation.

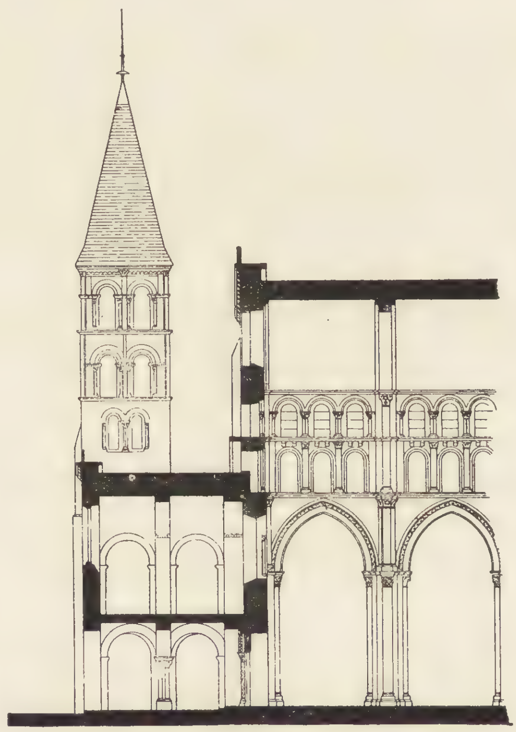

Fig. 69.—Section through Ante-Nave and Nave.

The Church of Paray-le-Monial, near Autun.

(Reduced from the *Archives des Monuments Historiques*.)

from the church on the eastern side; and, as Fergusson has well said [*History* (1874), vol. ii. p. 306] of San-Ambrogio, at Milan, if you were to add a clerestorey to the atrium, and if you roofed it over, the plan of these Italian churches would become almost similar to that of a French cathedral.

If any proof were wanted of the existence, even during the period of the Lower Empire, of a great central directing power—so far as regards Church Architecture and the ritual which necessarily affected it—it would be found in the form and character which distinguish, and serve to identify, the different churches erected about the same time in various and remote portions of the Roman world. Compare the Asiatic basilica of Roueiha, a village in the vicinity of Djebel Riha, in Central Syria, with the Italian basilican churches before mentioned. It is stated by the Marquis de Vogüé, *Hon. Corr. Member* (Royal Gold Medallist), in his *Syrie Centrale*, that the building is one of the sixth century, and from his sections and elevations it appears to be exceptionally well designed and put together. The triple character of the Jewish temple is here distinctly marked. The small buildings on either side of the basilica are tombs, and the sole entrance to the inclosure is through a fortified gateway. There the " stranger within the gate," the " proselyte of the gate," the Gentile and the unknown Galilæan, found protection and security from an oppressor or a pursuer, but he did not enter

the basilica, though he may have joined with his kind in prayers to the Most High; or, from his station outside, heard them repeated within.

In another part of the world, at Romainmotier, in Switzerland, comparatively close to the centre of power, another remarkable example of the early triple division of a church may still be studied. The main

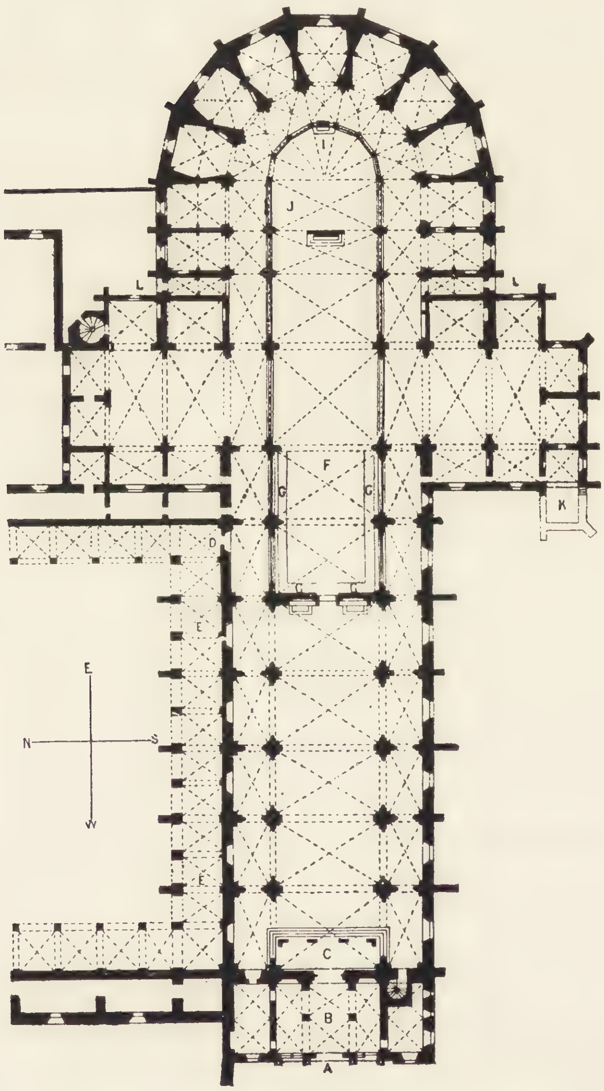

Fig. 70.—Plan of the Church of Pontigny, near Auxerre.
Scale: about 67 feet to an inch.

A, West entrance. B, Porch. C, *Tribune* or gallery. D, Entrance from cloister. E, Part of cloister still existing. F, Choir. G, Stalls. H, Sanctuary. I, Châsse of St. Edmond. J, Tomb of Queen Adèle. K, Chapel of St. Thomas-à-Becket (in ruins). L L, Passage-ways.

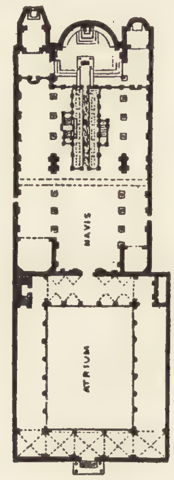

Fig. 71.—Plan of San-Clemente, Rome.
Scale: about 100 feet to an inch.

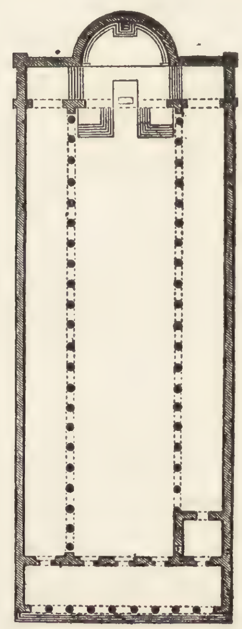

Fig. 72.—Plan of San-Apollinare-Nuovo, at Ravenna.
Scale: about 100 feet to an inch.

portion of this church is stated by the late M. Blavignac [*Histoire de l'Architecture sacrée du quatrième au dixième siècle dans les anciens évêchés de Genève, Lausanne, et Sion.* 8vo. Leipzig, 1853] to have been founded in the eighth century, though the ante-nave [fig. 75] is of a later period. That the building is a very early

example may be seen from the character of the columns and arches [fig. 77] of the nave, and the sketch of the exterior of the ante-nave [fig. 76] is sufficient to prove that even that portion of the church is not later than the tenth, or, at most, the eleventh century. Over the ante-nave is a second storey of similar size, shown on the left of the ground plan [fig. 75], which, according to Blavignac, " servait tantôt de catéchuménie, tantôt de " chapelle." He is of opinion that the small apse on the eastern side of this upper storey, corbelled out as it is into the nave, leaves no doubt of its having contained an altar. Moreover, a fact worthy of attention, that in the tenth century this church came under the domination of the Abbey of Cluny, may perhaps afford a clue to the origin of the ante-nave—which is an undoubted addition—the cession of the monastery of Romainmotier having taken place in 929, during the time of the Abbot Odilon. The small porch in front of the ante-nave is of a much later period, as may be seen by its pointed arches [fig. 76].

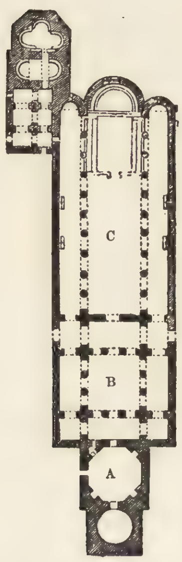

Fig. 73.—Plan of Church at Parenzo, Istria.

Scale : about 100 feet to an inch.

A, Baptistery.
B, Atrium.
C, Church.

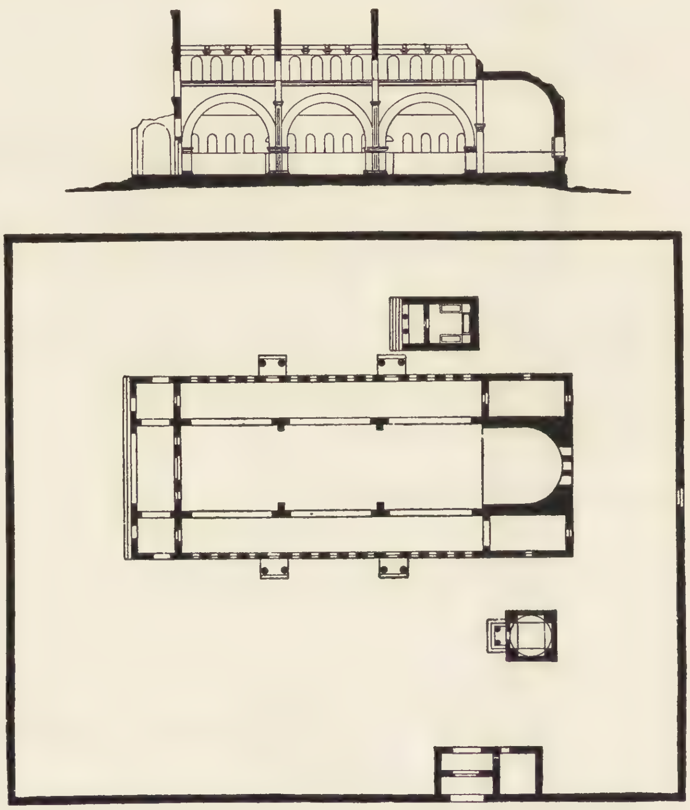

Fig. 74.—Plan and Section of Church at Roueiha, Central Syria.

(Reduced from *La Syrie Centrale*, plates 68, 69.)

An abbey church, still standing, about six miles from Oviedo in the north of Spain, affords another example of the triple division of basilica : that of the Monastery of Valdedios, in the district of Villaviciosa [figs. 78, 79]. It was founded by Benedictines in the ninth century, and consecrated by seven bishops in 893. The plan and section here given (it is unfortunate to be unable to give the dimensions of the building with any accuracy, but the scale of the section is exactly double that of the plan) are taken from the *Monumentos Arquitectónicos de España* ; and it will be seen from them that not only has the porch an upper storey, with a large opening into the nave, but there is also a storey over the sanctuary or chancel.

In fine, a host of similar churches founded in the ninth and tenth centuries in all parts of Western Europe might, with a little diligence, be cited to show that either a porch closed on all sides, or an ante-nave, was one of the recognised divisions of such buildings ; and there can be no doubt of the traditions which dictated its erection, or indeed of the purposes to which it was then applied. A conception of what these purposes were may perhaps be obtained by an inquiry into the ceremonies of the Church a thousand years ago—its ceremonies of penitence, of praise and thanksgiving, and its ceremonial procession.

In the primitive Church, "The discipline of penance [Gibbon's *Decline and Fall*, II. ch. xx. v.] was "digested into a system of canonical jurisprudence, which accurately defined the duty of private or public "confession, the rules of evidence, the degrees of guilt, and the measure of punishment." And again, in a

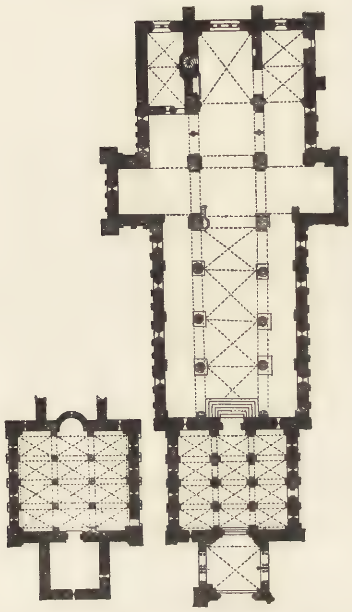

Fig. 75.—Plan of the Church of Romainmotier, Diocese of Lausanne.
Scale: about 67 feet to an inch.

Fig. 76.—View of the Church of Romainmotier.

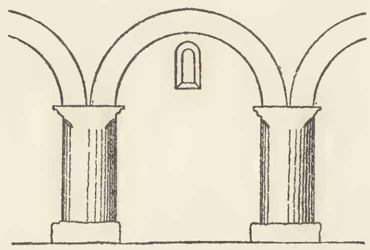

Fig. 77.—Nave Columns and Arches in the Church of Romainmotier.

Fig. 78.—Plan of the Abbey Church of Valdedios, Oviedo.
A, Porch or ante-nave.
B, Nave.
C, Sanctuary.

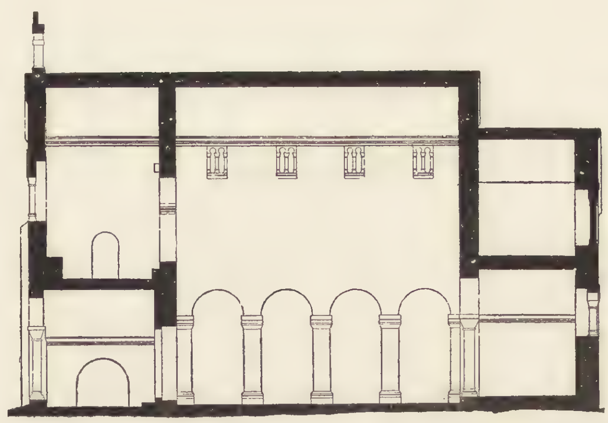

Fig. 79.—Longitudinal Section of the Abbey Church of Valdedios, Oviedo.

footnote, "The penitential jurisprudence was continually improved by the canons of the Councils. But as "many cases were still left to the discretion of the bishops, they occasionally published, after the example of "the Roman Prætor, the rules of discipline which they proposed to observe. Among the canonical epistles of

" the fourth century, those of Basil the Great were the most celebrated." The fifty-eighth canon of St. Basil, translated by Chardon [*Hist. des Sacrements*, iv. 263], runs thus :—" Celui qui est coupable d'adultère, sera " séparé quinze ans de la communion des Sacrements, quatre ans Pleurant, cinq Auditeur, quatre Prosterné, " deux Consistant, sans communier." A similar sentence is adjudged in other canons of the same saint—then Bishop of Cæsarea—to persons guilty of many other offences more or less heinous. These same canons ultimately became part of the Rule of the Order of St. Basil, which, approved and confirmed by successive Popes,

FIG. 80.—WESTERN PORTAL OR OPEN PORCH OF SAN-VICENTE, AVILA.
(From Street's *Gothic Architecture in Spain.*)

was the parent of the Rule framed in the sixth century by St. Benedict, the founder of the Order of Benedictines, whose domination, in the tenth and eleventh centuries, exercised an enormous influence over the Christian world; and in the twelfth, when the highest branch of the Order, the Cluniacs, were at the summit of their power, they directed and controlled all the arts of Western Europe.

As shown in the canon before quoted, there were four stations of penitents: first, they were to weep before the gate of the church; secondly, they were to be admitted to hearing; thirdly, to genuflexion, a repentance properly so called; and fourthly, to stand with the faithful at prayers, without partaking of the oblation.

Bingham [*Origines Ecclesiasticæ; or, the Antiquities of the Christian Church*, bk. xviii. ch. i.] explains that the *Weepers* were rather candidates of penance than penitents strictly speaking. Their station was in the church porch, where they lay prostrate, begging the prayers of the faithful as they went in. The *Hearers* were "the "first of those [penitents] that had any privilege to enter the church;" their station was in "the narthex or "lowest part of the church, [Might not the line of demarcation, marked by a strip of blue marble in the "nave of Durham Cathedral, be such a station?] where they stood to hear with the catechumens of the first "or second order, called Hearers, and were dismissed with them as soon as the sermon was ended, before "any prayers began." The *Kneelers* had their station within the nave or body of the church. "The *co-standers*, "so called from their having liberty (after the other penitents, energumens and catechumens were dismissed) "to stand with the faithful at the altar, and join in the common prayers and see the oblation offered;" but they were not permitted to make their own oblations or partake of the Eucharist—the participation of which was the highest state or consummation and perfection of a Christian. The second chapter of the same book [Bingham's *Antiquities*, xviii.] treats "of the ceremonies used in admitting penitents to do public penance, and "the manner of performing it in the church." On Ash-Wednesday, the first day of Lent, all penitents who either then were admitted, or had been admitted before, were presented to the Bishop *before the doors of the church.* They were clothed in sackcloth and barefooted; and deans or arch-presbyters of their respective parishes brought them up for presentation to the Bishop. This done, the penitents were conducted into the church, where the Bishop with all the attendant clergy fell prostrate on the ground, singing the seven penitential psalms for their absolution. After which, the Bishop rising, gave them imposition of hands, sprinkled them with holy water, and put ashes upon their heads, declaring at the same time that as Adam was cast out of Paradise, so they, for their sins, were cast out of the Church. Then he commanded them to be expelled from out the doors of the church; and the clergy following them, repeated the words, "In the sweat of thy face "shalt thou eat thy bread: for dust thou art, and unto dust thou shalt return." At the end of Lent, on the Thursday before Easter, the deans and presbyters again presented the penitents of their respective parishes before the gates of the church.

The severity of the penitential canons continued to the time of the Crusades. "Vers le onzième siècle, "on commença à se relâcher sur l'imposition des pénitences canoniques, eu égard à la faiblesse des Chrétiens: "on les changea en des aumônes, des prières, et la récitation d'un certain nombre de psaumes, ce qui se "pratique généralement à présent." [*Encyc. Théolog.*, Migne, vol. x., col. 815.]

But, apart from observances of penance, there were other ancient ceremonies which were performed at the doors of the churches, and outside them. One of these took place on Palm Sunday, that is, the Sunday before Easter. A procession was formed to carry the Holy Sacrament to the cemetery, where an altar was arranged to receive it. After the customary prayers had been sung, the procession returned with the Holy Sacrament to the door of the church, which was found to be closed; but upon a *tribune* or gallery over the door, as at Vézelay, or under an arcade, as at Cluny, were stationed choristers [see *Dictionnaire*, art. "Porche," figs. 4, 5], who chanted the *Gloria, Laus*, &c., then *Israel es tu rex*, &c. Whereupon the officiating priest, having replied with the *Omnipotens*, &c., knocked three times at the door of the church with the staff of the cross which he carried, singing *Attollite portas.* The clergy within, having asked three times "Quis est iste," opened the door, when the officiating priest sang *Dominus fortis*, &c., *Dominus virtutum*, &c., and the procession entered. This ceremony—for the performance of which the western portal of San-Vicente, at Avila, in Spain [fig. 80], seems expressly arranged—symbolised the entry of Jesus Christ into Jerusalem on the Day of Palms. The Apostolic references to the same are numerous: "On the next day much people that were come to the feast, "when they heard that Jesus was coming to Jerusalem, Took branches of palm trees, and went forth to "meet him" [St. John xii. 12, 13]. "And it came to pass, as he [Jesus] went to Jerusalem, that he passed "through the midst of Samaria and Galilee" [St. Luke xvii. 11]. "Others said, This is the Christ. "But some said, Shall Christ come out of Galilee?" [St. John vii. 41]. There is nothing extraordinary in giving the name of "Galilee" to the place in which the passage of the Saviour to Jerusalem was thus symbolised.

At Durham Abbey Church a procession was formed, "every festival daie," from the Galilee into the Church and back again, in honour of the "holie man Saint Beede" [see footnote, p. 143 *ante*].

Again, almsgiving was almost a ceremony in the ancient Church, and even at the present day the doors of Roman Catholic churches in all countries are periodically thronged with suppliants and sick, with mendicants of all kinds, few of whom are ever sent empty away. The fact is as old as history. "And a certain "man lame from his mother's womb was carried, whom they laid daily at the gate of the Temple which is called "Beautiful to ask alms of them that entered into the Temple. . . . And as the lame man which was healed "held Peter and John, all the people ran together unto them in the porch that is called Solomon's, greatly "wondering" [Acts iii. 2, 11]. Moreover, the criminal flying from justice was safe if he reached the door of a church; his arm once within the iron handle of the door, any man who dragged him from it exposed himself to excommunication.

The various ceremonies which had to be performed at the doors of a church of the eleventh or twelfth century rendered necessary the construction of some shelter from the inclemencies of the weather; and this

is supported by a statement made by M. Albert Lenoir, in the first volume of his *Architecture Monastique*—wherein he has referred to the subject of these ante-naves and the ceremonies performed within them—that, if the weather was unpropitious, the procession on Palm Sunday took place in the nave, and it knocked at the door of the choir instead of that of the nave, to symbolise the entry into Jerusalem. In fine, Viollet-le-Duc attributes to the action of Cluny the addition of these ante-naves. They were not included in the original design, and it was only during the second half of the twelfth century that an ante-nave was added to the Cluniac church of Charité-sur-Loire. There is reason to believe, continues Viollet-le-Duc, that this programme was only adopted in the twelfth century, and that it was intended to provide for the extraordinary increase of the faithful in Cluniac churches, which at that time were the most venerated in Christendom, and contained, in the terms of a charter granted by Louis VII. to the Abbey of Cluny, "les "membres les plus nobles de son royaume."

Furthermore, Gibbon, in a well-rounded period, says, "The awful mysteries of the Christian faith and "worship were concealed from the eyes of strangers, and even of catechumens, with an affected secrecy, which "served to excite their wonder and curiosity." The *missa* or mass celebrated for the faithful was different from that to which catechumens were permitted to listen; and when the day of such converts had gone by the mass sung outside the doors of a church was not as full or complete as that celebrated within. That mass was celebrated in the porches and ante-naves is known from the quotation made by Lorain [*Essai Historique sur l'Abbaye de Cluny*, 2nd ed. p. 66] from a MS. pertaining to the Cluniac church of Châlon-sur-Saône (also quoted by Viollet-le-Duc, in the extract from his *Dictionnaire*, given by Mr. White at page 152 *ante*), which runs in the original—"In quibusdam ecclesiis sacerdos in aliquo altari foribus proximiori celebrat missam, "jussu episcopi, pœnitentibus ante fores ecclesiæ constitutis," which, literally translated, is that in "some "churches the priest celebrates mass, by injunction of the Ordinary, at one of the altars nearest the door, the "penitents being outside the door of the church." An altar existed in the ante-nave and close to the door of the nave of Cluny Abbey Church; and the recess, A, in the Galilee of Durham Cathedral [fig. 59, p. 142 *ante*], almost adjoins the door which was the main entrance to the nave before Langley blocked it, in the fifteenth century, with an altar and a tomb for himself. The "Lady of Pitties Altar"—the one referred to as A—seems a most appropriate spot for the celebration of a mass for penitents. Mass was there celebrated for the special comfort of women, as stated in the sixteenth-century MS. quoted at page 143 *ante*, and there is nothing to militate against the possibility of the statement being as accurate as tradition will allow. At the same time the existence of that line of blue marble in the pavement of the nave west of the doors leading into the north and south aisles, and east of the font, points rather to a station for penitents, or even catechumens, than for women only [fig. 60]. The distrust of women, apparently more acute at Durham than elsewhere, may have been a local peculiarity, though the legend which rendered St. Cuthbert so averse to them has been ascribed also to other saints in other parts of the world. That the intercourse of the monks with the other sex was permitted, or at least winked at, is known from well-authenticated evidence, and the many canons against such intercourse passed by the various ecclesiastical councils held in France and England during the eleventh and twelfth centuries go far to prove it. Indeed, as shown by the late Mr. Wright [*Womankind in Western Europe* (1869), pp. 102–3] the Anglo-Saxon clergy had wives, and it was only in the thirteenth century that the marriage or concubinage of the clergy was generally abolished.

That the porches of churches were often used for the trial of criminals is proved by the number of the laws passed to prohibit their use for such purposes. The practice of Louis IX., King of France (1226–1270), and known as St. Louis, was doubtless emulated in England, by ecclesiastics particularly. In the memoirs of the Sire de Joinville, a contemporary of St. Louis, in the Dissertation of Du Cange (*Memoirs of John, Lord de Joinville*, 1807, vol. ii., pp. 32, 33, translated by Thomas Johnes), entitled, "On the Pleadings at the Gate, "and on the forms which the Kings of France observed when they sat personally in judgment," occur the following passages: "Our kings . . . seated themselves at the gates of their palace, to render justice "indifferently to all who should come and ask it from them. . . . This is what St. Louis, and our kings, "usually practised when inclined to hear the complaints of their subjects, and do them justice, . . . this "justice, truly royal, since it was exercised personally by the king, was well known under the name of 'Pleadings "'at the Gate.'" Though there is nothing to prove that Bishop Pudsey held his court in the Galilee of Durham Cathedral, or that his contemporary, the Bishop of Ely, held his court in the Galilee of Ely Cathedral—not the present porch, but the building which it superseded—there is every reason to believe that both bishops did so; and that the ante-naves of the great Cluniac churches were often put to a similar use. Whether the Hall or Chapel, invariably to be found over a church-porch of the twelfth and thirteenth centuries, was used as an ecclesiastical court is not ascertained; and that is a question the elucidation of which is more likely to come from a study of the history and procedure of the primitive and the mediæval Church than from research of a purely archæological character.

The immediate result of this inquiry seems to bring out the following facts: (1) That in Western Europe, prior to the twelfth century, it was usual to approach the nave of a great church through a porch of two storeys placed against the west front; (2) That in the twelfth and thirteenth centuries the Cluniac churches were provided with ante-naves, which contained a large open gallery or *tribune* as at Vézelay, or an open

arcade, as at Cluny, from which persons coming from within the nave could parley with or address persons stationed in the ante-nave; (3) That the hall or chapel over a church-porch contained a niche or small apse on its east side, as at Autun Cathedral; (4) That a similar niche exists in the upper storey of the ante-nave of Romainmotier, and in the gallery or *tribune* of the ante-nave of Vézelay Abbey Church; (5) That in the course of the thirteenth century the porches tended to disappear, the Cluniac fashion of ante-naves did not spread, and the west entrance to a cathedral began to take the form of deeply recessed portals, like those of the west front of Laon in France and of Peterborough in England; (6) That the gallery or *tribune*, as in the ante-nave at Vézelay, is repeated over the west doorway in the open portal of San-Vicente, a church of the twelfth-thirteenth century, standing just outside the walls of Avila in Spain [fig. 80], and that this marked feature served some special object which was common, at that time, to all the great churches of Western Europe.

It is, moreover, clear that no one attempts to maintain that the porch of Paray-le-Monial [figs. 67, 68, 69], or of Pontigny [fig. 70], or of Valdedios [figs. 78, 79], was a Lady-Chapel; or that the ante-nave of Cluny [fig. 64], of Vézelay [fig. 65], of Romainmotier [fig. 75], was a Lady-Chapel; or that these porches and ante-naves were specially erected for such a purpose. They were all, however, whether Cluniac or Cistercian, Abbeys of the Benedictine Order, submitting to the same Rule, which sustained little modification until the thirteenth century, when the Dominicans and Franciscans took new Rules from their leaders. Why, then, should the porch or ante-nave of the Benedictine Abbey Church of Durham be singled out as something different from all the other examples which exist or have existed in other parts of Western Europe, and the erection of which took place about the same period? Again, in the Benedictine Abbey, wherever situated, not only was the same Rule observed, but the same ceremonies were performed; and the higher ecclesiastics who occupied them were men of the same stamp, if not of the same race. In England, even in the twelfth century, such ecclesiastics were not Englishmen, but as distinct from the latter, in education, manners, and bearing, as Englishmen in India at the beginning of this century were removed from the "natives" over whom they were placed. The native inhabitants of Durham and the north of England, in the eleventh and twelfth centuries, are not likely to have been superior to those located in the neighbourhood of any other Benedictine Abbey or Cluniac Priory in France; and the barriers raised against their admission into churches which prevailed in France prevailed equally in England. The porch or ante-nave was as necessary in this country as it was in France, and there is little or nothing to justify an attempt to dissociate the so-called "Galilee" of Durham, as a recognised portion of the Abbey Church, from the porches and ante-naves hereinbefore described.

*** Mr. S. J. Nicholl (who joined in the Discussion of this Paper), writing on the 29th August 1890, when the foregoing was in type, states as follows:—In the first place, it should be noted that the porch was prescribed as necessary to a church. St. Charles Borromeo, in his instructions on church-building, said that, where there is no atrium, there should be a portico, erected on marble columns or pillars of brick or stone, equal in length to the whole width of the church; or at least there should be before the chief door a vestibule of such a kind as to be constructed on two columns or pillars, to be sufficiently spacious to extend more widely than the door of the church, and to be square on plan. This protection was evidently necessary on account of the rites to be celebrated at the door. At baptism the candidates were kept outside the church, so that the priest, representative of Christ, had to bring the child into the church, as Jesus Christ had to lead man driven out of Paradise to the presence of His heavenly inheritance. That a portion of the marriage service took place in the porch is evident from Chaucer's *Wife of Bath*—"She was a worthy woman all her life, Husbands at the "church door had she five." In the churching of women, the service also begins in the porch, the woman thus acknowledging her unworthiness to enter till she receives the blessing of the priest and is introduced by him. More to our present purpose is the ceremony of the reconciliation of penitents by the Bishop, when on Holy Thursday they came to receive pardon for their sins before presenting themselves to receive Holy Communion. Clad in tattered or very simple garments, barefoot, their beards and hair uncut from the previous Ash-Wednesday, they remained at the entrance of the church or porch, prostrate, in an attitude of humiliation and supplication. After reciting the seven penitential psalms, the Bishop went to the church door and gave his hand to one of the penitents, raising him up; he, in turn, to another; and so on, till they were all able to follow the Bishop into the body of the church. This ceremony was symbolical of the return of the prodigal, and seems quite in harmony with the Bishop holding his court within the porch. The only other rite I shall quote as bearing on the subject is the blessing of the new fire on Holy Saturday, which takes place in the porch. On this occasion the clergy, in going out of the church into the porch, are said to do so as if following the footsteps of the holy women who had to go out of Jerusalem to reach the Sepulchre in which our Lord's body was laid; and to be said to go "into Galilee" is but a very slight extension of this idea.

*** Mr. W. White, F.S.A., the author of the Paper, writing in reference to a remark in the Discussion [p. 153 *ante*], states as follows:—Mr. Blashill says correctly that the south transept (First Pointed) of Old St. James at Dover was purely ecclesiastical; but the three recesses in the east wall were of the date of the Middle Pointed, when I believe the building came to be used for the Lord Warden's Court.

LXXI.

CHURCH FITTINGS. By John P. Seddon, *Fellow*.

Mr. Arthur Cates, *Vice-President*, in the Chair.

Mr. Vice-President and Gentlemen,—

THIS Paper is the outcome of a request that I would undertake to supply a want said to be felt by students, that of providing a reference collection of examples of Church Fittings—objects which it is said are now left too much in the hands of others than members of the architectural profession.

In defence of the particular manner in which I have striven to perform this allotted task, I desire to say that it struck me that although a selection of ancient precedents would obviously be a most desirable thing for this Institute to possess, yet such might easily be found by the students themselves. Indeed, owing to the healthy emulation fostered by the Architectural Association *Sketch-book*, and other kindred works, all extant specimens of this character will soon have been discovered and published, even if they have not been so already; and that, consequently, they only need to be sought for and classified—a useful task which I would commend as a subject that might be set for one of the Institute Prizes. Then, again, it occurred to me that most architects whose practice has been specially ecclesiastical must have accumulated stores of designs made by them for church fittings, and that a collection of such would prove of great practical value; still, it would be a somewhat invidious task for me to ask for, or to make selections from, these. Numerous examples of such works have, however, from time to time been published in the professional journals, and to search for and arrange them would be another very useful thing to do, and yet not that which I had been specially invited to undertake. All, then, that seemed to remain open was that I should give you the results of my own experience such as it has been; and that possibly my doing so might induce other architects to follow my example, and by so gathering up the fragments of their life's work, which in all probability would otherwise be doomed hereafter to destruction as waste paper—a fate I greatly regret to learn

has happened to the drawings of some eminent architects now deceased—such a collection as was desiderated might ultimately be formed.

At a later date I was further pressed to occupy an evening of the Session with a Paper on the same subject, and fear that I somewhat unwisely gave my consent, since the egotism for which I thought I could find some manner of excuse in respect to the drawings has become thus more aggravated. Then I also find that this same ground has been already fully and worthily occupied by Mr. Micklethwaite in his valuable work entitled *Modern Parish Churches*,* so that there is but little left for me to say on the subject in addition; and although his treatise is unaccompanied by illustrations, those in Mr. William Butterfield's *Instrumenta Ecclesiastica* † form a mine of practical suggestions as regards the design of church fittings, and may well be consulted by students, as I am glad to say they used to be by me.

All, then, that I can pretend to do is to show you how I have tried to carry into practice the principles from the above and other sources. I know too well how imperfectly this has been done, and that the results have no special claim to "correct-"ness"; but the scorn with which Mr. Micklethwaite has treated that attribute has emboldened me to present to you what certainly is deficient in that respect. If, however, I submit them, in trepidation, to your friendly criticism, I venture to hope that they may be suggestive to younger students, and at any rate that the exposure of their shortcomings, from which I do not flinch, may tend with advantage to their non-repetition in the works of others.

I have been in the habit of considering it as an axiom that the fittings of a church should correspond in character with that of the church which contains them. But whether such would now meet with general acceptance is far more than I can aver. Being, as we are, without any specific style of architecture for the present time, church architects are perforce obliged to adopt some one or other of those styles that have been developed in past ages. There may, therefore, be difference of opinion, and there certainly is occasional diversity of practice, as to making the fittings of a church accord precisely with the particular style of architecture of the fabric,—as when, for instance, the latter is of Lancet or Geometrical traceried Gothic of the thirteenth or fourteenth century, and the former are not infrequently now designed in the Perpendicular of the fifteenth century. Historically considered, there would seem to be no incongruity in placing within a building articles of furniture of a presumedly later date than its own; it is a debateable question, however, whether such would conduce to rhythm, harmony, and other æsthetic considerations.

Where new churches are concerned, decision on this point is a comparatively simple

* *Modern Parish Churches:* their plan, design, and furniture. 8vo. Lond. 1874.

† *Instrumenta Ecclesiastica*, edited by the Ecclesiological, late Cambridge Camden Society. 4to. Lond. [title-page undated], Jan. 21, 1847. The illustrations composing this work, with few exceptions, are by Mr. William Butterfield, F.S.A., *Royal Gold Medallist*; his name is the only one mentioned in the "Prefatory "Notice" To find the book in the new catalogue of the library, it is necessary to look for it under the heading of "Church Fittings," or that of the "Ecclesiological Society;" but its title nowhere appears therein.

matter, but it becomes far more complicated when it is with old churches that we have to deal. Such buildings cannot be preserved merely as objects venerable for their antiquity; they are seldom of but one age or style, but rather are the growth of many ages, and a gradual compilation in many styles, and they sometimes have necessarily to be refitted for modern use. No doubt there is a golden rule which applies to them, that, namely, which is so stoutly maintained by the Society for the Protection of Ancient Buildings,—to leave them, as far as may possibly be, alone. No one now quarrels with an Elizabethan or a Jacobæan pulpit found in an older church of the Gothic era; but, given that a new pulpit be needed for it, would it be desirable to design it in a style altogether of later character than that of the church itself? No hard and fast rule can be laid down that the style of new fittings should not be of a later date than that of the principal part of the structure, but certainly the propriety of a converse treatment is, to say the least, doubtful—namely, the selection of an earlier style for church fittings than that of the church which is to contain them. There is, however, perhaps one comfortable reflection that the architect who is called upon to use his own judgment as to the solution of this and like vexed questions may indulge, namely, that though he is tolerably sure to meet with criticism calculated to embitter his life, whichever course he may adopt, yet that, after he has gone, his work, like that of others of no very remote period, may become so far canonized, as it were, that posterity may allow that whatever is is best, and that for it to attempt to amend his work would be then but modern vulgarity.

Awaiting, however, that prospective period of immunity, I feel that I must now stand or fall by my own practice, which has been founded upon a predilection for the early Geometrical traceried Gothic style of this country. When, however, I have had to deal with existing structures, a considerable portion of which are in a style of later date, I have hailed with pleasure opportunities for working in the Perpendicular style which is admirably suited for church fittings. In all cases I have been ready to seize any chance of employing new materials or modes of workmanship which have appeared to me not incongruous or out of harmony with the style adopted; and particularly, when possible, to obtain the assistance of the best of those subsidiary arts which in themselves would proclaim the work to be of this nineteenth century and no other.

It happens that the Committee of the Consulting Architects of The Incorporated Society for Promoting the Enlargement, Building, and Repairing of Churches and Chapels are engaged in revising the Paper of "Requirements and Suggestions to "persons applying for aid from that Society;" and, as this matter affects to a certain extent the interests of the architectural profession generally, it is intended to submit the Paper to the consideration of this Institute before its revision is finally settled. I will, therefore, refer to it in respect of those points on which it touches in connection with my present subject of Church Fittings.

In its second clause, headed "*Style and Form*," which necessarily affect more or less the disposition, at any rate, of church fittings, the Paper states with no uncertain

sound that " no style is more generally suitable for a church in the United Kingdom " than native Gothic as developed in its successive periods. In the proportions and " general features as well as in the details good ancient examples should be studied."

Eclecticism, though a special feature of the day, has not yet been carried to such an extent as to render it necessary to consider as other than exceptional the experiments that have been made by some individual architects to modify our native Gothic, by the introduction of ideas taken from Continental buildings. The apsidal termination of chancels is perhaps the most commonly adopted of these, but it is an exotic which is not likely to be, nor is it desirable that it should be, naturalised among us. To some architects, again, all mediæval architecture is considered an anachronism nowadays; and these, holding the pointed arch to be the origin of all evil, architecturally speaking, would revert to the semicircular arched styles, or even to those which never advanced beyond the classic column and entablature. They do not, however, seem, as yet, to have succeeded in showing that such negation of all the science and beauty since evolved in Christendom can suffice to bring church architecture into touch with modern surroundings. At any rate, the day is not yet come when the public can admit the claims of even St. Paul's Cathedral to embody the spiritual aspirations of worshippers to rank equal with those of Westminster Abbey. Still, the long-drawn aisles of our ancestors have no doubt lost their special processional uses, and it is time that internal obstructions to sight and sound should be reduced to their minimum; architects may emulate with engineers in meeting modern needs, and that without disuse of our own excellent and appropriate native architectural language. The Paper referred to wisely leaves ample freedom for this purpose, and contents itself with the suggestions that, " In plan, a new church should " consist of a nave, with or without aisles and a well-proportioned chancel, which may " also have aisles and an organ-chamber, vestry or vestries, or, where the church is " of sufficient size, a side chapel for daily or occasional services"; and, further, " If " the funds do not suffice to finish a design satisfactorily, or if the circumstances of " the neighbourhood render it probable that, at no great distance of time, the building " may be enlarged, it is better to adopt a good plan to be carried out in parts as funds " permit, than to attempt the completion of an inferior building." It is also, in my opinion, far preferable to keep the plan of a church simple, and dignified by grandeur of scale, than to affect an elaborate arrangement of the structure with comparatively diminutive size. Low side-aisles, with lean-to roofs, though suitable enough for country churches, are in my opinion too often employed for churches in towns and cities, where greater height throughout would be desirable. It is to be remembered that ancient churches are the growth of centuries, commenced with narrow side-aisles covered under one roof with their central nave, and that the wider aisles, with their lean-to roofs, and the clerestoreys to the naves were subsequent modifications. Very wide naves, now often affected, demand corresponding height to be in due proportion, and also chancels larger, and the furniture more pronounced, than otherwise necessary, so that they cannot be considered economical. Transepts are not suitable

additions to provide increased accommodation, and are inconvenient to furnish with fixed seats, which should face eastward; and they entail considerable expense, as they should not be less in height than the buildings with which their roofs intersect. The larger piers necessary at the crossing are sensible obstructions of the internal area, requiring rather a preaching gallery than a pulpit to circumvent them, as has been attempted with more ingenuity than success in the case of the Church of St. Nicholas at Great Yarmouth. The position of the organ chamber is another point in which the arrangement of the general plan may affect the nature of important church fittings, but as it, and the whole treatment of organs, is now under the consideration of a Special Committee, it would be premature to discuss it at present.

Fonts.—The receptacle to hold the water for the Sacrament of Baptism should be placed, for obvious reasons, practical and symbolical, near the entrances of churches. The Paper of Requirements and Suggestions says that "the font should be at the "west end of the nave, but must not be under a gallery. Care is to be taken that "proper space is allowed for the sponsors. The font to be of stone or marble, as "directed by the Canon, and large enough to admit of the immersion of infants. To "be provided with a cover, plug, and chain, and pipe carried to a dry well and not "into a drain. If the font be of porous stone, it should be lined with lead; it should "be always placed on a platform at least one step in height."

The importance of the sacred use of the font demands that it should be of a size and character calculated to produce a corresponding effect. Our library contains a very interesting volume entitled *Illustrations of Baptismal Fonts,** which has a valuable introductory Essay. In this it is said that "perhaps there is no subject in the whole "range of ecclesiastical antiquities so difficult to discuss and arrange in all its "departments, historical, architectural, and decorative, as that of Baptismal fonts." And again, it is spoken of as "a boundless field." It is beyond my present purpose even to attempt to deal exhaustively with it, though I would commend it as one to be undertaken, and for which an Institute medal might well be offered. It is impossible even to glance through the illustrations of the above-named work without experiencing a feeling of admiration and patriotic pride at the beauty and variety of the examples given, all of which are taken from our own country, and which might have been immensely extended. The late Viollet-le-Duc, on the contrary, lamented the paucity of those left in France; nor, indeed, are the specimens given by him at all remarkable. Many distinct and interesting types are, however, to be found on the Continent, as in the Rhine Provinces, and notably in the fine example in the Cathedral of Limburg, on the Lahn. Of the far more numerous English examples, Mr. Paley remarks that the earlier their date the freer the fancy, and the more indulgent the genius, of

* *Illustrations of Baptismal Fonts*, with an introduction by F. A. Paley, M.A., Honorary Secretary of the Cambridge Camden Society. 8vo. Lond. 1844. The author, or perhaps editor, of this book, whose name is omitted from the title-page, and only appears under the initials "T. C." in a preface, is Thomas Combe, M.A.

the artist. Norman fonts appear to excel in these points, and a very fine specimen, recalling somewhat the effect of that at Limburg, exists in the small Norman Church of Kilpeck, in Herefordshire, and a very noble one of simple ornamental character is in Great Kimble Church, Bucks, retaining remains of rich colouring, and yet neither of these is to be found in the collection of the illustrated work above named. The fonts of the thirteenth and fourteenth centuries, according to Mr. Paley, are varied in ingenious devices and ornamental detail, but contain little beyond mere architectural ornament, and the later ones of the Perpendicular Period exhibit a quite different class of decorations, which are no longer grotesque, but saintly and lifelike, as perhaps the inventive genius was then declining, or the subjects for design were felt to be exhausted.

In a large church the font may well occupy as prominent a position at the western as the altar does at the eastern end, and its dignity may be enhanced by considerable increase in the height of the platform with its steps, by sumptuousness of cover, as at Ufford Church in Suffolk, or even by such a baldachin-like surrounding as that at St. Peter Mancroft Church, Norwich, or that at Trunch Church in Norfolk, or it may be still further emphasised by being placed within a special structural baptistery; but in smaller churches it may be treated in a less stately and more picturesque manner at one side of the building, instead of centrally on its axis.

The size of the font itself admits of considerable variation, and must be regulated according to circumstances; at East Dereham Church, in Norfolk, the font is no less than 7 feet in height, but more ordinary dimensions are from 30 to 40 inches as to height, and 30 inches as to width.

In shape it may be square, as are many of the Norman fonts; or oblong, as are some of those illustrated by Viollet-le-Duc, and described by him as obviously intended to afford facility for total immersion. They are, however, more usually circular, multi-foiled, or octagonal in plan.

The materials used for ancient fonts were usually of stone or Purbeck marble, but sometimes of metal, as bronze or lead, and in the latter named material are some of Norman date, with rich ornamentation of a Byzantine character.

Of the fonts which I have been called upon to design, that for Rotherham Church, in Yorkshire, as a memorial to the Rev. William Newton, formerly vicar of the parish, was executed by Mr. Hems in red sandstone, with the bowl covered with a diaper of foliage corresponding with the remarkable Perpendicular carving to the capitals of the columns of the arcades of that fine church. It is fitted with a lofty oak-traceried cover, suspended from the ceiling and provided with a counter-weight. In accordance with the instructions given me, I tried in the design to emphasize the fact of its being so suspended, to prevent its having the effect of that treatment having been an after-thought. The font for Llandaff Cathedral was the gift of the late Dean Williams. It is executed in Caen stone, and the bowl is carved with panels of sculpture illustrative of the story of Noah's Ark and the Deluge. The platform on which the font stands is of grey Pennant stone, with panels inlaid with encaustic tiles. The font of Redruth Church, in Cornwall, is somewhat after the same type, but with a circular bowl within

the octagonal upper arcading. In its execution the local granites, marbles, and other stones, in great variety, were employed. The font of St. Margaret's Church, Westminster, is of the variegated marbles from the Babbacombe Down quarries, owned by the Messrs. Blackler of St. Mary Church, Torquay, by whom the font was made. In the choice of the marbles the darkest tones are used below, with lighter gradations above, all of warm tints with the exception of the central shafts, which are of green marble to give contrast of colour. A circular bowl within the octagonal upper portion is decorated with a belt of Heaton's cloisonné mosaic of white and yellow lilies, in groups issuing from a conventional representation of water with gold-fish and shells. A somewhat similar idea is carried out in a smaller and simpler font at Hook Church, near Surbiton; this is also in the Devon marbles, but the mosaic is "Rust's glass," the colouring of which harmonises well. In these few examples I have had the opportunity, of which I have tried to avail myself, of making use of materials which are placed at our disposal in these days, giving us, I think, a legitimate means to distinguish our own work from that of our predecessors. Some other examples of a simpler character are also shown in my drawings as suitable for smaller churches; two of these—that for

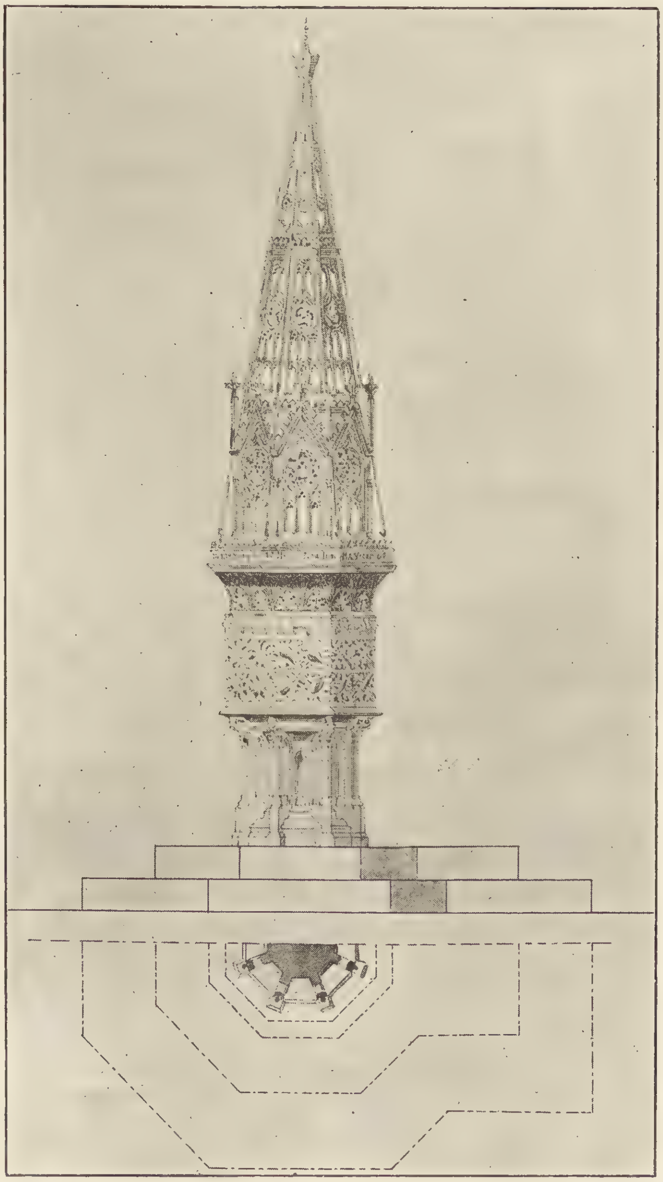

Fig. 81.—Font and Cover: Rotherham Church.

From a coloured drawing by John P. Seddon.

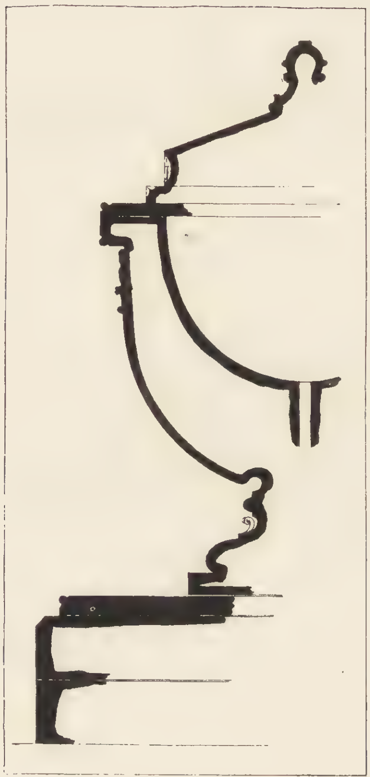

Fig. 82.—Half-Section.

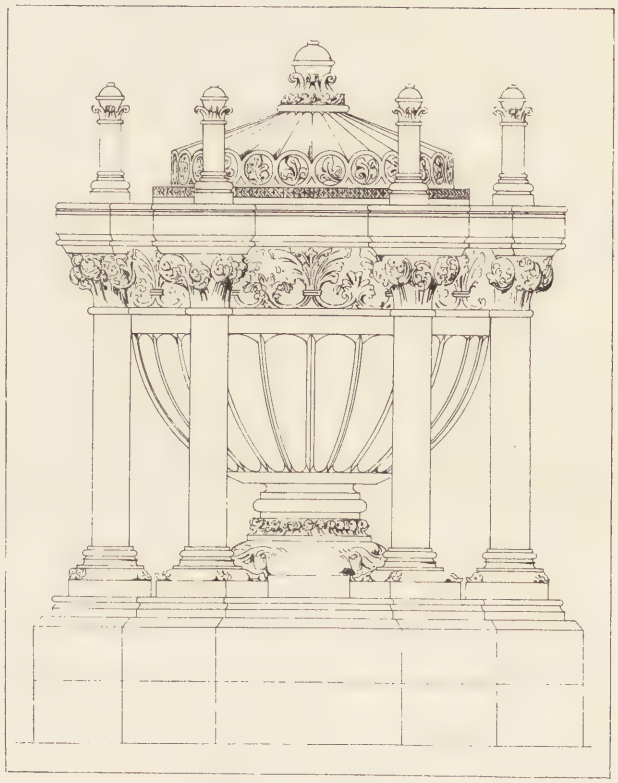

Fig. 83.—Elevation.

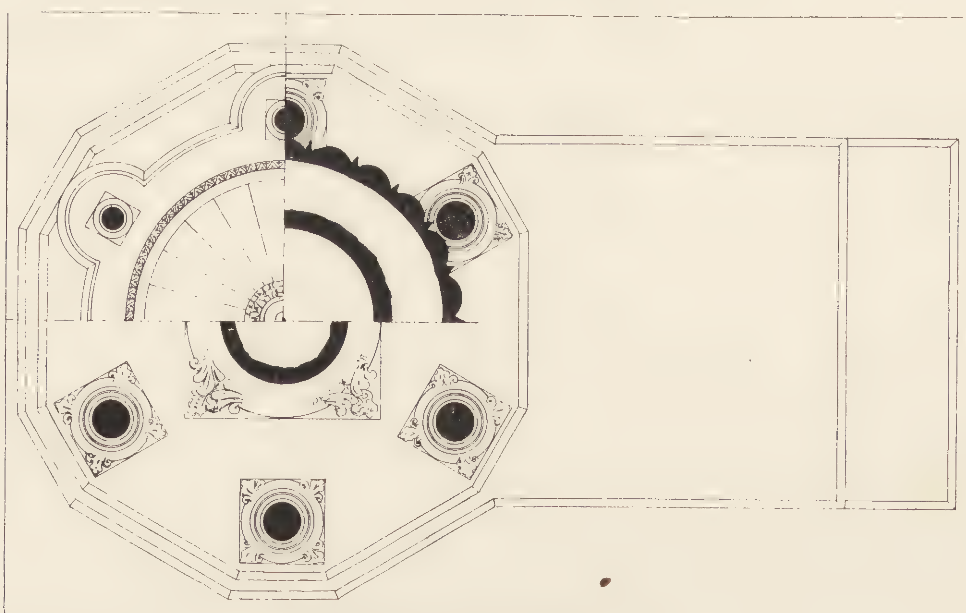

Fig. 84.—Plans at different Levels.

A Font and Cover, designed by John P. Seddon.

Adforton Church, Herefordshire, and that for St. Barnabas's Church, Gorse Hill, near Swindon Station, Wilts—are pentagonal on plan, having one point of the pentagon facing eastward; these are of stone, and the former has marble shafts to the columns. Two others—those of Ullenhall Church, Warwickshire, and Cwmbran Church, Monmouthshire—are octagonal at top, developed from square bases, the former having a circular bowl shape within the octagon, carved as if covered with netting enclosing fish.

It may be remarked that care is required in respect of the arrangement of seats around fonts in order that there may be space left for the sponsors at baptisms, it being difficult in many churches to find room for them should there be more than one or two present.

Pulpits.—Among church fittings the pulpit forms an important feature, and yet it is quite secondary in this respect both to the altar and the font. Indeed, its importance may be, and often is, unduly exaggerated, as is the case in many of the churches and cathedrals in Belgium, and elsewhere on the Continent, where it is enlarged and decorated in an ultra-naturalesque manner carried to the degree of caricature. The higher class of sculpture lavished upon some of the pulpits in Italy, as in the splendid examples in the city of Pisa, forms an exceptional excuse for their exceeding magnificence. Still, as Mr. Ruskin says, " It is worth while pausing for a moment " to consider how far the manner of decorating a pulpit may have influence on the " efficiency of its service." He thinks the pulpit ought never to be highly decorated, the speaker being apt to look mean or diminutive if the pulpit be either on a very large scale or covered with splendid ornament; and he says that he has noticed that when pulpits are particularly magnificent, sermons are not often preached from them, but rather from some more temporary erection in another part of the building, as though the preacher disliked to match himself with the magnificence of the rostrum, lest the sermon should not be thought worthy of the place.

The Incorporated Society's Paper simply remarks on this subject, that " the pulpit " should be placed near to the entrance to the chancel, of moderate height, and so " placed as not to intercept a view of the chancel." Perhaps, as a general rule, the north-east end of the nave is the best position for the pulpit, as the light there is steadier and direct sunshine avoided.

Mr. Francis Dollman has published many excellent examples of ancient pulpits, while other specimens have been lithographed by the Incorporated Church Building Society; the majority of these seem to have been curiously small in diameter, and yet high from the ground to their floor, with tapering and richly moulded and carved funnel-shaped bases rising from slender stems, giving the appearance of what has been called a wine-glass type; and it is not easy to see how some of these, which have no provision for a staircase remaining, can have been reached. For modern use the floor of the pulpit will ordinarily be about 3 feet from the ground, and the height of its bookboard from its own floor about 3 feet 6 inches; and 2 feet 9 inches for the internal diameter will suffice.

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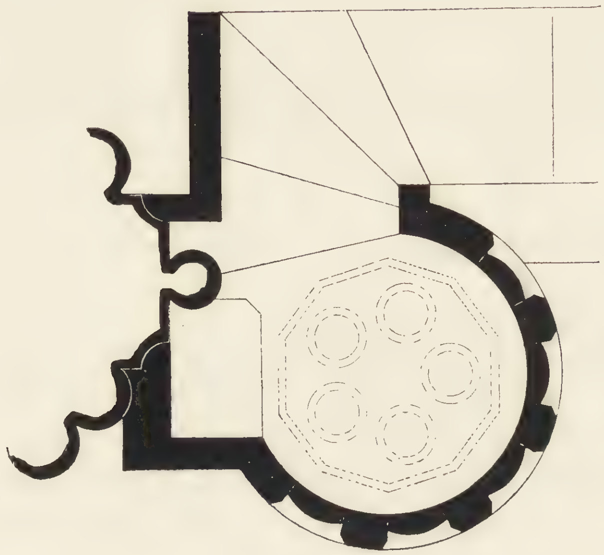


FIG. 85.—PLAN.

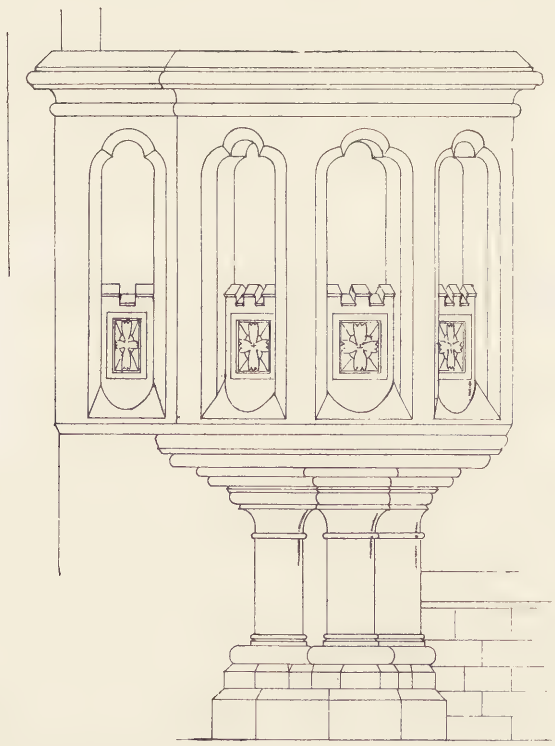


FIG. 86.—ELEVATION.
PULPIT AT GORSE HILL CHURCH, SWINDON.

Among the designs for pulpits submitted is one now in course of execution by Mr. Hems, in oak, for the choir of Norwich Cathedral, as a memorial to Dean Goulbourn [Illustn. xxxiii]. This pulpit has the floor 4 feet 6 inches from its ground line, and is 3 feet 6 inches internal diameter. Another pulpit, the gift of Dean Goulbourn, for the nave of the same cathedral is being executed in stone from the design of Messrs. Carpenter and Ingelow. This will be somewhat higher and larger, as befits its position, commanding a larger congregation. The pulpit executed from my design for Llandaff Cathedral is of stone, with Devonshire red and Irish-green marbles used alternately for the shafts of its smaller columns, with green serpentine for the central group of shafts. Around the pulpit are panels containing the figures of Moses, David, St. John Baptist, and St. Paul, carved from models by Mr. Woolner, R.A. For St. James's Church, Paddington, and Betchworth Church, Surrey, I have designed pulpits executed by Messrs. Blackler in their Devonshire marbles, and in the latter there is a considerable portion of Rust's glass-mosaic ornamentation introduced. This material I also employed, in conjunction with Fulham majolica ware instead of the marble, in two other

pulpits: those of St. James's Church, Great Yarmouth, and Great Kimble Church, Bucks. But though, in my opinion, the effect is harmonious, I have found that care is necessary in shaping and moderating the sizes of the pieces of the majolica ware, which, like most pottery, is liable to crack with variations of temperature if made of large dimensions. I may say, however, that I have had reason to be satisfied with it for capitals and bases of moderate scale to go with marble shafts, as it admits of richly modelled ornamentation being combined with colour—an effect obtainable by no other means, to my knowledge, except with surface paint; stone giving only the opportunity for carved work, and marble for mouldings in coloured material, but neither for both in combination.

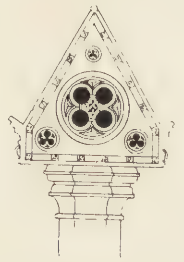


Fig. 88.
Side Elevation.

In small country churches it is worth consideration whether it would not be as well for the sermon to be preached from a platform provided with a lectern, instead of from a pulpit, as the preaching is not often a strong point in connection with the service, and consequently hardly requires in all cases to have a special place provided for it. The design of the pulpit executed for the Church of Ullenhall, in Warwickshire, partakes of this character.

Lecterns.—More frequent use might doubtless be found for lecterns than is now usually the case; for instance, in connection with fonts, pulpits, choir-stalls, and for the reading of the Gospel and Epistle from their respective steps before the altar. That alone from which the Lessons are read is at present a common article of furniture in churches, and Mr. Micklethwaite says that he can find no sufficient reason for this particular custom, which seems to date but from the early part of the seventeenth century. It would appear, therefore, hardly desirable to place the lectern for the Lessons in so very prominent a position as the centre of the passage in the chancel, where it cannot but intercept the direct view of the altar from the nave. I have so shown it in the interior view of St. James's Church, Great Yarmouth, where, however, it has not yet been executed, and I should prefer to place it to one side, more as shown in another unexecuted design submitted, that intended for Kennardington Church, in Kent.

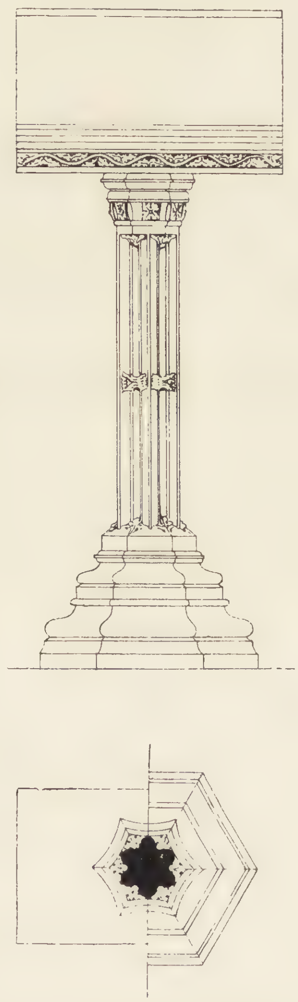


Fig. 87.—Plan and Elevation of Lectern: Caerleon Church.

The form of lectern also known as "the Eagle Desk" is, or was, according to the same authority, specially distinctive of that used for reading the Gospel from, and not

so suitable for any other purpose. Still, as but one lectern only is now placed in the majority of churches, there does not seem to me to be any cogent reason why this form should not be thus employed. As a matter of fact, it is so commonly, and has been so designed by me.

I submit several designs which I have had executed: that for Llanbadern Fawr Church, near Aberystwith, has an eagle of majolica pottery supported upon stone; while at Ingham Church, Norfolk, a similar eagle is used in connection with a support made of oak. Other simpler specimens in wood for smaller churches, less open to criticism for undue novelty, are also submitted.

For eagle desks, no doubt the more costly materials of brass and bronze are suitable. An excellent characteristic one of Perpendicular design, which was fortunately found buried in Norwich Cathedral, has been restored, and is now used therein.

The Altar or Lord's Table.—The latter is the term used in the Incorporated Society's Paper, wherein it is thus noticed: "The Holy Table should be of sufficient length, "according to the width of the chancel, and of proper height—not less than from "three feet to three feet six inches." This sufficient length may, I think, be defined, as suggested by Mr. Micklethwaite, as being 8 feet for the principal altar of the smallest church, and from one-third of the width of a large chancel to one-half of that of a narrower one. For ordinary width, 2 feet 3 inches, to enable it to be easily reached over; and for ordinary height, 3 feet 5 inches. The material is usually wood, and its form should be simple and plain, and yet not mean, as if never intended to be seen. The upper edge should be square and not moulded, as its object is to be usually vested; and the altar-cloth can thus hang from it without crease or fold.

The examples of such altar-tables executed from my designs are from Christ College Chapel, Brecon; St. James's Church, Great Yarmouth; Gorse Hill Church, near Swindon, &c. Some of these are shown with the super-altar-shelf upon and attached to them. But the better plan now generally adopted is to make the altar-shelf, which is to receive the cross and candlesticks and flower vases, a fixture projecting from the east wall of the chancel. This plan was adopted at St. Barnabas's Church, Gorse Hill, and my drawing shows this fixed altar-shelf as executed, the material being Devonshire marble.

Altar-rails were only introduced into churches during the seventeenth century, but the feature is one that has now become common. Their main use is simply to afford support to communicants while receiving the Holy Sacrament, so that they are not necessarily fixtures, or provided with gates. Indeed, where a chancel screen exists at the entrance to the chancel, no other real or apparent mode of protecting the sanctuary from intrusion is requisite.

Altar-rails should, as stated in the Incorporated Society's Paper, stand upon one step only; more steps at that point, if in front of the rails, are dangerous for infirm people; and if behind them, inconvenient for the officiating clergy in compelling them

to stoop too much. "Ample space," to quote again from the same Paper, "must be "left in front of the communion-rails for the access of communicants; in no case "less than four feet from the front edge of the kneeling step," and "There should be "no steps for at least four feet eastward from altar-rails, and none less than three feet "westward from the Holy Table."

The designs for the altar-rails of Norwich Cathedral have been recently carried out by Messrs. Starkie Gardner and Co., in brasswork, enriched with enamel and bosses of spar, supported by a range of coupled columns, with tripled and quadrupled groups at the ends, the shafts of all of which are of Devonshire marbles. Other simpler altar-rails of oak have been executed at Holmer Church, near Hereford, where one end of each portion of the rails is secured to the walls. It is absolutely necessary that altar-rails should be perfectly firm, and strong enough to afford support to persons kneeling against them.

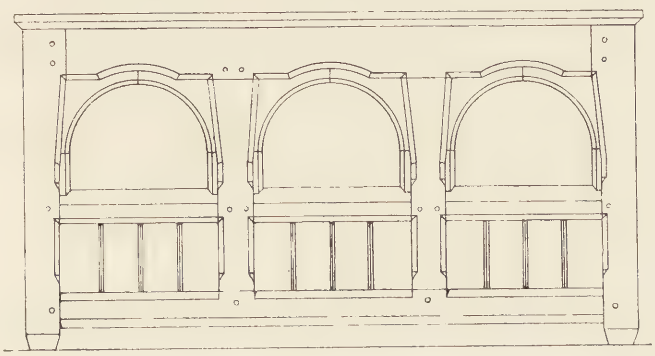


Fig. 89.—Front Elevation.

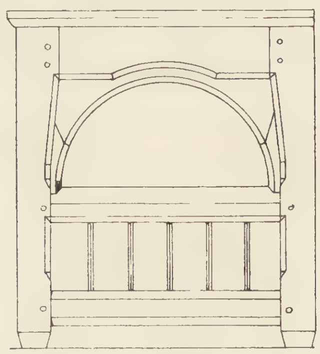


Fig. 90.—End Elevation.

Altar Table: Glewstone Church.

The Reredos.—Though an article among church fittings of perhaps the highest importance, a reredos is not absolutely necessary, and consequently finds no place in the Paper of "Requirements and Suggestions" to which I have so often referred. It is, indeed, so completely an object of luxury, that its cost could have no claim for aid from any charitable society, but is rather fitted to be the subject of private munificence, or of a memorial. Consequently, a church is better without a reredos than only furnished with a mean one, such as would occupy the position otherwise likely, sooner or later, to be properly treated; and as a temporary provision, a good dossal cloth and canopy would suffice. The purpose of the reredos is to give dignity to the altar-table, and it should be designed so as to concentrate attention upon and about that, the principal feature in a church; and certainly not so as to distract eyes to itself. It is not the place for sensational sculpture or paintings, or for loud patterns in encaustic tiling or the like. If an altar-table be in advance of the eastern wall of the chancel—and, wherever a chancel has an apsidal termination, it should be so in advance (its right position being at the chord of the apse)—a reredos is almost

an essential, as the table left there alone would appear insignificant. If, however, the table be against the east wall, a sumptuous and costly reredos may occupy the whole chancel end; still, even then a portion of the composition, not much wider than the table itself, and of moderate height, should be emphasized and marked out from the rest as the reredos proper.

The crucifix, or in its place the symbol of the Cross triumphant, and therefore of a decorative character, is perhaps the best object to occupy the centre of the reredos; the worst, I think, is that which is most fashionable, viz., a representation of the Last Supper, particularly if in sculpture, as it is essentially a subject for the pictorial art. To my grief, an ineffective white marble edition of it is placed in the middle of the reredos I designed for St. James's Church, Paddington; otherwise this was carried out by Messrs. Blackler in varied Devonshire marbles, with inlaid panels of rarer marbles. Mr. Hems executed that which I designed, as a memorial to its former vicar, at St. Saviour's Church, Bath. This is in stone, and takes a slightly apsidal form, different from that of the chancel itself; its panels are filled with rich sculptured foliage in alabaster, in which the seven doxes are interwoven, surrounding the cross within the vesica piscis of the central panel, the emblems of the Evangelists appearing in the outer ones. The reredos of St. Peter Mancroft, Norwich, was also executed by Mr. Hems in oak, from my design, in the Perpendicular style of which that church is so notable an example; a simpler example is that at Llanbadern Church, near Aberystwith. In the reredos of Llandaff Cathedral it was my good fortune to secure the zealous services of the painter, D. G. Rossetti; and at his decease the three paintings with which he decorated it were lent for exhibition among the collection of his works at the Royal Academy.

Seats.—The term which forms the heading in the Incorporated Society's Paper relating to these most necessary of the articles of church fittings is "Seats." It is comprehensive enough to include movable chairs as well as fixed benches. A church should not be cumbered with its seats. By the Society's rules all seats in the nave and its aisles must face eastward, and certainly those in transepts should do so, which, however, renders any depth of transept unsuitable. Chancel aisles should preferably be seated with chairs rather than with fixed seats, to allow of their being placed facing north or south when occupied by part of a general congregation, or eastward when small services may be held there as in a chapel. Again, chairs afford greater facility for removal when it is needed to provide a passage through the chancel aisles for retiring communicants, which is far more convenient than their being forced to return through the chancel itself.

It is further required that "there must be an open passage up the whole length of "the centre of the church, from west to east, and from the principal entrance not less "than four feet wide where the width of the nave is under eighteen feet, or five feet "where this width is exceeded. Side passages must not be less than three feet in "narrow aisles, but four feet where practicable." This requirement is desirable not only because the general effect of the church is greatly enhanced thereby, but also

because on occasions, as during funeral services, ample width of passages is needed. A good plan is to make the passage between the fixed seats of such a width that chairs may, when wanted, be placed on both sides of the central passage, and on one side of the side passages, clear of the minimum width to be maintained; chairs so placed, it is said, may be reckoned in the seat accommodation.

It is further suggested in the Paper that "the seats throughout the body of the "church should be uniform in design and with a height of back from the floor of not less "than two feet seven inches nor more than two feet ten inches; but that a height of "two feet eight inches is recommended. Again, that the distance from the centre of "one seat to that of the next should be three feet. There must not be any capping "on the top of the backs projecting on the side towards the seats: the seats should be

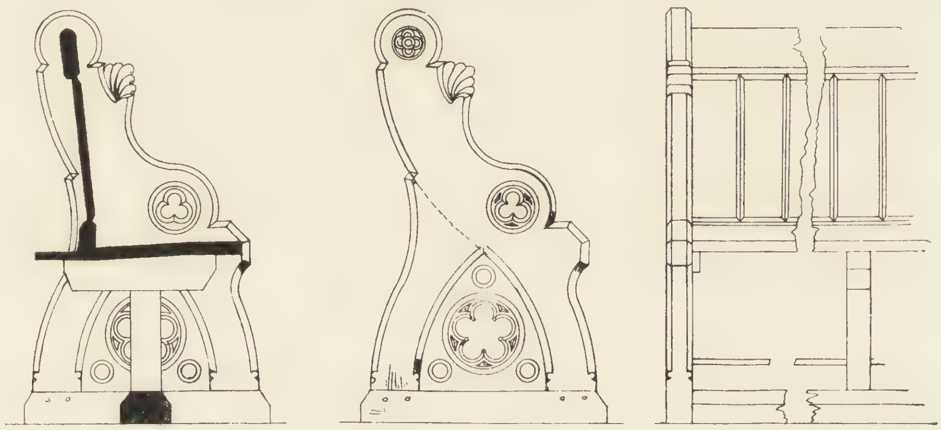


Fig. 91.—Seats: Arminghall Church.

"level, or but slightly rising or hollowed; and the backs upright for the height of six "inches from the seat; but they may slope backwards above not more than one inch, "or a like slope may continue from seat to tip of back. Facilities for kneeling in all "cases to be provided. The width of the seat-boards for adults to be not less than "thirteen inches. The backs should be close above, but the space below the seats left "open.

"Sittings on movable benches placed in the passages, or on seats with their backs "fixed against the north and south walls, are not considered by the Society in the "enumeration of sittings to be provided. Flap seats are inadmissible.

"Twenty inches in length must be allowed for each adult. Seats intended exclu- "sively for children must allow at least fourteen inches in width and twenty-eight "inches from back to front, and must be provided with backs.

"In re-seating old churches, where existing widths will not admit of greater length "in the seat than sufficient to afford a space of eighteen inches to each adult, such "dimension will be sanctioned. The ends of seats next the walls must be kept clear of "the walls."

In the foregoing regulations it has been borne in mind that while on the one hand undesirable that church seats should be luxurious lounges, they should at least be comfortable. The result arrived at from the combined experience of the church architects forming the committee differs slightly from the seats proposed by the eminent authority, Mr. William Butterfield, in his pamphlet entitled *Church Seats and Kneeling-boards*. The back of the seat he advocates is 2 feet 7 inches from the floor, is perfectly straight from seat to tip, and the kneeling-boards are five inches high and three and a half inches wide; and the whole scheme must, he says, be accepted without attempt to amend it.

I have shown specimens of several arrangements that I have worked out from time to time, giving a moderate and varied slope to back and seat; but, though I could contend with more or less success, I should be content to follow for the future more strictly the suggestions as now given in the Society's Paper, which is not, in my opinion, too

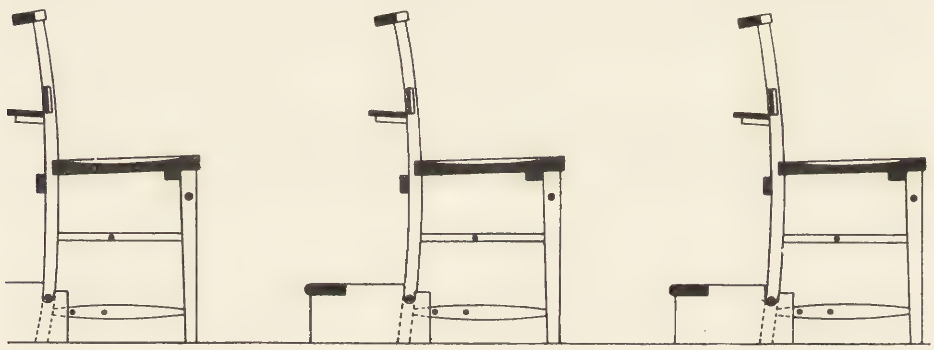


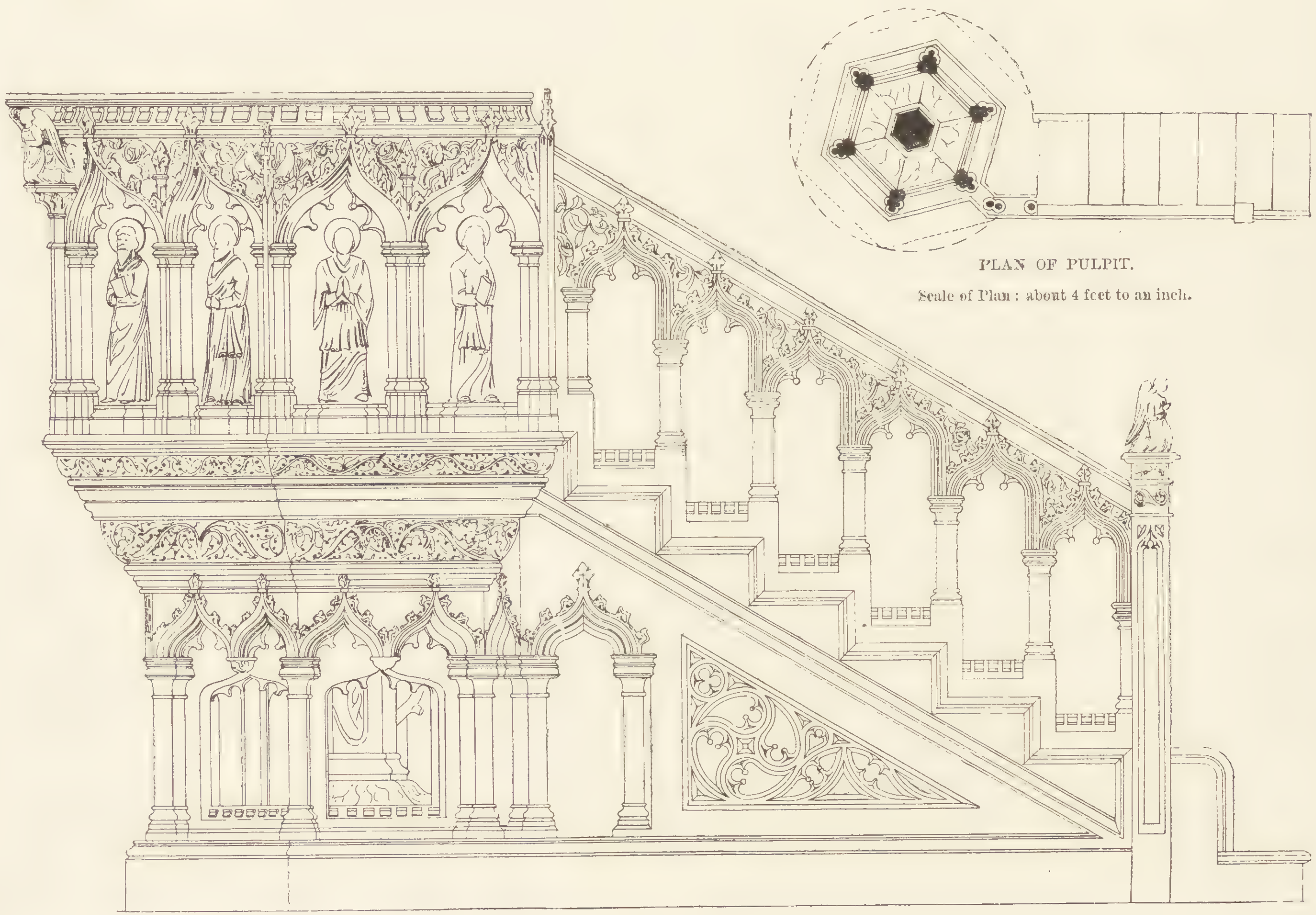
Fig. 92.—Combination of Chairs: Church at Grange Town, near Cardiff.

stringent. As to the facilities for kneeling, considerable difficulty has arisen in their adjustment to chairs as well as to fixed seats; but I submit an arrangement for the combination of four chairs, a convenient number to be connected with one kneeling platform to the set, which has been worked out at the new church just built at Grange Town, near Cardiff, by Mr. J. C. Carter, who was joint architect for that structure with myself; and, as it has been greatly appreciated by the congregation, I may commend it to your consideration. To quote from the Paper again:—

"All the seats for the congregation should be on one level, and that the same as "that of the passages between them.

"Special seats for children in schools are contemplated and approved by the Society, "but when not so provided, and adults and children are seated together throughout, no "allowance for reduction of width of sittings from that required in the case of adults "only is recognised by it."

Choir Desks and Stalls.—"Chancels," as stated in the revised Paper of the Incorporated Society, "ought not to be arranged for the use of the congregation, but "for the Clergy and Choir. A clear space of not less than five feet must be left



PLAN OF PULPIT.

Scale of Plan : about 4 feet to an inch.

J. P. Seddon del.

ELEVATION OF THE PULPIT: NORWICH CATHEDRAL.

[See page 171.]

"between the fronts of the bookboards where the space is under eighteen feet, but should "be at least eight feet where space permits." The most suitable arrangement accordingly is to have two rows of seats, and for the clergy and choirmen to occupy the back row on each side, the westernmost being appropriated to the officiating clergy and provided with a special reading-desk in front, and this row should be from 3 feet to 3 feet 6 inches deep. The front row of seats on either side to be appropriated to the choir-boys, for which a depth of about 2 feet 9 inches, from back to front of bookboard, will suffice. It is often difficult, however, in small churches to afford the above-named minimum spaces between the opposite bookboards, in which case it is better to omit them as articles designed as fixtures, and to be content with removable ones, so that the proper space may be cleared when necessary. The boys' bookboards are often made too high for convenience when kneeling, particularly when less depth can be spared for them. Three feet is their utmost height, and less, say 2 feet 9 inches, is generally preferable—many of the old examples are lower still. When standing to sing, the boys can hold up their books, or be provided with a light small bookboard, raised to a higher level than the fixed one, by metal-work; a shelf for books below the fixed bookboard is also a requisite for both ranges of stalls. The front boys' bookboard should be rather open in design, that their conduct during service may be observable. The back row of seats may well be divided one from another by elbows—at any rate, those specially intended for the clergy should be so; and these, where there are returned stalls, may be appropriated for them. It is not necessary always to subdivide those for the choirmen; falling *misericordia* are quite unnecessary, and nowadays an anachronism. In large and important churches, and where chancel screens are used, returned stalls are not only permissible but desirable, and one or both of the rows may be so treated, but generally the upper back ones only. The front row or boys' stalls should have the floor level with that of the chancel, but the back row, for the clergy and men, should be raised one step above it, but not more as a rule.

The specimens given for choir stalls and desks comprise those that I was commissioned by Canon Cazenove to supply for the nave of Rochester Cathedral as a memorial to his father; also those executed from my designs for the Church of St. Nicholas, Great Yarmouth, where I was asked to provide open canopies to the back row of the stalls, so that while the dignity they seemed to need in so large a church might be attained, protection from draughts could be afforded, when required, by drawing a curtain behind, yet, on ordinary occasions, forming no real obstruction to the view of that part of the vast congregation seated in the chancel aisles.

The stall-work of Llandaff Cathedral, designed by the late John Prichard, architect, was left by him without the figures he intended should occupy the niches he had provided. I have lately filled them with some twenty statuettes executed by Mr. J. Milo Griffith, sculptor, and exhibit two of the models made for them as examples.

Church Screens.—The practical object of church screens is great, but their æsthetic effect is still greater, and yet, unfortunately, prejudice prevents their being employed

as often as they might be; and in some dioceses they are almost prohibited. They mark in the first place the limits of the spaces appropriated respectively to the congregation and the clergy; and where churches are left open during the day—as all should

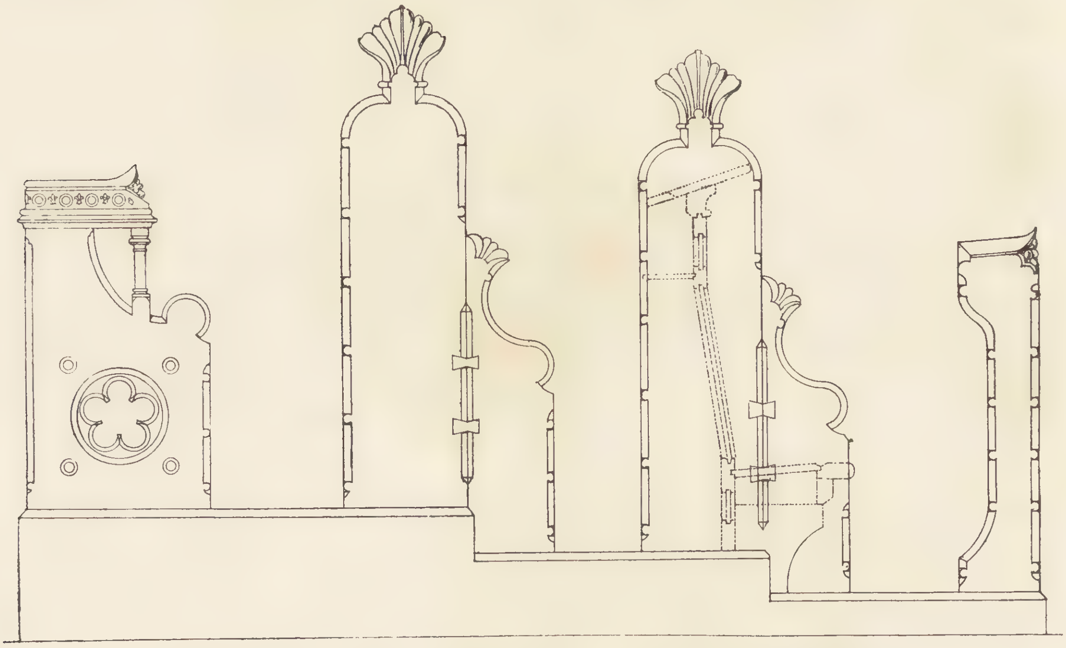


Fig. 93.—Elevation (towards Nave) of Stalls: Rochester Cathedral.

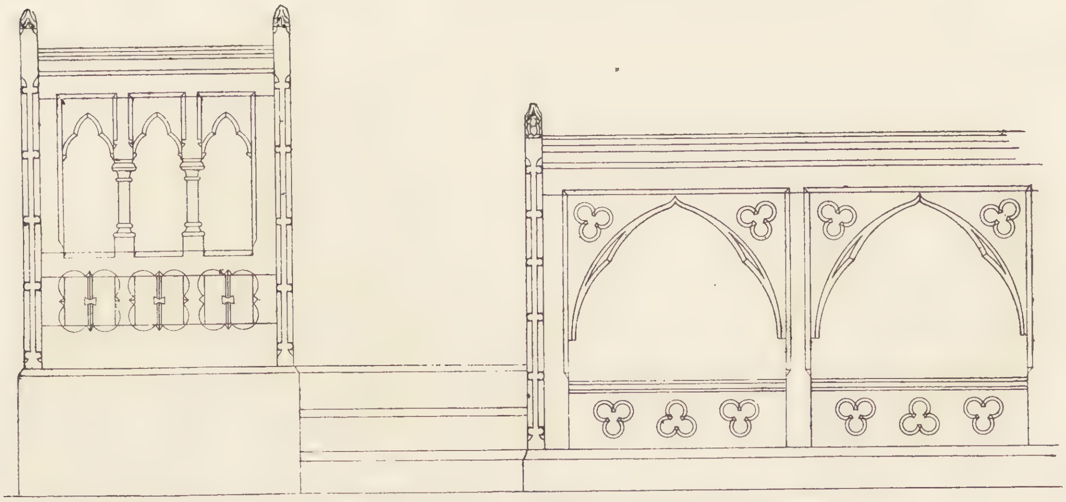


Fig. 94.—Front Elevation of Stalls: Rochester Cathedral.

be—for private worship, they afford the protection that is then required for the more sacred portions of the edifice. Screenless, a church interior appears unfurnished and empty, while the screens themselves may, and should, be made objects of great beauty.

Close below, they may be so open above, at and about the level of the eye, as not really to obstruct vision in any direction; but they may tower to a considerable height at a higher level, with advantage to the general effect, and serving to increase apparently the distance and mystery of the interior. They may be carried right across, at the entrance to the chancel and its aisles, from the nave and its aisles, and again so surround the chancel—by being continued through the arches that separate it from its aisles—as to concentrate interest on and about the altar in a manner not obtainable by any other means.

A rood-loft may or may not be combined with the rood-screen, and occasionally used.

Old screens yet remaining in ancient churches serve to show how much has been lost by the destruction of the majority of them, and the nakedness of the interior of such churches as those of North Walsham, in Norfolk, and of Woodbridge, in Suffolk, is painfully evident; yet the congregation of the latter church actually refused to allow the late vicar, on his cession of the living, to restore the noble oak screen, the lower part only of which is now extant, as a memorial of his family to his father. At Ingham Church, Norfolk, the lower part of a most sumptuous chancel screen survives, in the less usual and more stately material of stone.*

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* This Paper was illustrated, during its delivery, by a large number of original drawings, principally of works executed under the direction of Mr. Seddon, who had also prepared a series of designs for church fittings of every description, an instalment of which—twenty-six sheets—he presented to the Institute Library, viz.:—

1. Altars.—{Glewstone Church: elevations [figs. 89, 90, *ante*]. / Mountain Ash Church: elevations.
2. Altar.—Brecon College Chapel: elevations and plan.
3. Altars.—{Gorse Hill Church, Swindon: elevations. / St. John's Church, Great Yarmouth: elevations.
4. Altar rails.—{Holmer Church: elevation. / Norwich Cathedral: elevation.
5. Super altar.—Gorse Hill Church: elevation.
6. Credence and Sedilia: elevation and plan.
7. A font and cover: elevation, plan, and section [figs. 82–84 *ante*].
8. A marble font: elevation and plan.
9. Fonts. —{Adforton Church: elevation and plan. / Maindie Church: elevation and plan.
10. Fonts. —{Gorse Hill Church: elevation and plan. / Hook Church: elevation and plan.
11. Font.—Llandaff Cathedral: elevation and plan.
12. Font and cover.—Rotherham Church: elevation and plan [fig. 81 *ante*].
13. Font.—St. Margaret's, Westminster: elevation and plan.
14. Fonts.—{Ullenhall Church: elevation and plan. / Cwmbran Church: elevation and plan.
15. Lecterns.—{Eythorne Church: elevation and plan. / Ingham Church: elevation and plan.
16. Lecterns.—{Caerleon Church: elevation and plan [figs. 87, 88 *ante*]. / Llangwm Church: elevation and plan.
17. Pulpit.—Ayot St. Peter's Church: elevation and plan.
18. Marble and mosaic pulpit.- Betchworth Church: elevation and plan.
19. Pulpit.—Gorse Hill Church: elevation and plan [figs. 85, 86 *ante*].
20. Pulpit.—Lampeter Church: elevation and plan.
21. Pulpit.—Norwich Cathedral: elevation and plan.
22. Pulpit.—Ullenhall Church: elevation and plan.
23 and 24. Reredos and stalls.—St. Peter Mancroft, Norwich: elevations and plan.
25. Stalls.—Rochester Cathedral: elevations [figs. 93, 94 *ante*].
26. Church seats.—Ayot St. Peter: Arminghall Church [fig. 91, *ante*]; Margate Church, and Oldcastle Church.

The subject of organs is, I am glad to learn, under consideration now by a committee of experts in the Institute; and I await with interest the forthcoming report in preparation by that committee, in which, no doubt, the best position in churches —a vexed question—will be discussed, as well as the proper form and appropriate decoration of the instrument itself. I would only express my own opinion that architects should confer with organ-builders, and learn the exact use of every part before they attempt to design organs, and that I have faith that the strictest utilitarian method will be found to produce the best result. I fear organ-builders are too apt to say that they can adapt their instruments to suit the architectural ideas of architects, and consequently to derange, out of deference to preconceived notions of symmetrical arrangements of pipes, the mechanism of the interior. I am not sure that such symmetry is desirable in all cases, now that the organ is seldom placed at the west end, or on the screen at the east end of the nave; few people really face an organ when it is placed at one or both sides.

JOHN P. SEDDON.

[Notes by WILLIAM WHITE, F.S.A., *Fellow.*]

It seems to me that the great snare of the present day, when the illustration of architectural precedent is carried by most of the younger men to such perfection, is that of eclecticism. Precedent is of the greatest value as a guide, but architecture which is merely or mainly a compilation or reproduction of precedent, without modification to existing circumstances and requirements, or without systematic and scientific control, cannot possess either life or originality. This must necessarily be the case in the planning of churches to receive furniture fitted to present use; and, as Mr. Seddon has said, transepts are too often introduced to the great inconvenience of interior arrangement. They may, nevertheless, be made of the greatest service, in giving variety to outline, inside as well as out, or in affording light towards the east end of the nave of a church with low aisles, or otherwise insufficiently lighted.

(1) Mr. Seddon speaks of many mediæval pulpits "of a wine-glass type," having a body rising from a high and slender stem. I have looked upon these rather as representing a candlestick, the preacher being the light to illumine the congregation. The pulpit was commonly placed on the south side of the church; probably from a merely practical consideration, lest the preacher should be troubled with the sun in his eyes. But in the present revival it has been removed, too frequently, to the north side, even where a north aisle might have suggested a southern position for the pulpit. This, I have no doubt, has arisen from an idea of symbolism, suggested by the Rev. G. Ayliffe Poole, one of the first writers on the revived symbolism of our Church. In cases where no stairs appear to have been provided, the floor of the pulpit was probably reached in some cases by means of a step-ladder; by which means also the rood-loft was frequently reached, in cases where the doorway is far from the floor, without any appearance of a staircase having been provided.

LXXIII THE ARAB HOUSE OF EGYPT (xxxvi).

From a photograph.

HOUSE OF THE LATE COUNT ST. MAURICE, CAIRO.

[See page 226.]

LXXIII. THE ARAB HOUSE OF EGYPT (xxxv)

From a photograph.

COURT OF AN OLD HOUSE AT CAIRO.

(See page 2[illegible].)

(2) I consider the central position for the lectern to be not really so obstructive as it might seem at first sight, for it intercepts the view of the altar only from such as might be in the central passage of the nave. But the obstruction by its height is much greater if placed in the chancel—raised higher, perhaps, by several steps than it would be in the nave. For other reasons, also, the nave is the proper place for the lectern for the reading of the Lessons. But the lectern itself is rarely high enough above the step or platform on which he stands for the reader to see his book without bending his head down, to the very great detriment of his voice and the distress of his hearers. On this account, in a large church at least, there should always be a gabled double lectern nearly of the height of the reader. It is of far less consequence that his face should be partly hidden, than that his voice should be emitted at a right angle to the book, or at all smothered by the bending down of his throat. At a summer meeting of Oxford extension students, I remember Professor Max Müller struggling successfully against the lowness of the desk from which he delivered his admirable address to a very large audience; but very few succeed under such circumstances, and I have made special observation of the manner in which freedom of utterance is affected by it in the reading of the Lessons in church.

(3) The altar should be in no case less than 3 feet 3 inches, or more than 3 feet 5 inches, in height. In no case should the length be less than 6 feet 6 inches. For breadth 2 feet is sufficient. I have found ancient slabs as narrow as 1 foot 10 inches and 1 foot 11 inches. At Newland, in the Forest of Dean, the high altar was 9 feet 3 inches long and 2 feet 3 inches wide, and I have found the breadth of several altars to be that of a vesica struck from the diagonals of a square, which proportion is also that of the chancel of certain Early churches. If the front, or frontal, of the altar be divided into compartments, it should be into three, and not into two. Altar-rails should be not more than 24 inches high.

(4) Chairs are almost invariably uncomfortable on account of the dip being in the middle of the seat, instead of towards the back, and from the bars of the back being made to recede behind, instead of being brought forward a little beyond, the top rail, and giving no support to the small of the back, where most required. A special chair has been made, under my direction, obviating these defects, at the same cost as the ordinary church-chair. The same observations apply to the discomfort of benches, when closed backs are made to slope from the seat upwards in a straight line. But open-back seats are uncomfortable very often from having only a narrow back rail not reaching down *to within* 7 *or* 8 *inches* of the seat.

I consider Mr. Seddon's Paper a valuable contribution towards the elucidation of the subject of church fittings.

WILLIAM WHITE, F.S.A.

⁂ The Discussion [see verbatim report in *The R.I.B.A. Journal*, Vol. VI. pp. 289–293] was opened by Mr. William White, F.S.A., whose "Notes" on the Paper

will be found on the preceding pages. It was continued by Mr. S. J. Nicholl, Mr. R. H. Carpenter, F.S.A., Mr. E. J. Tarver, F.S.A., Mr. William Woodward, and the President. A brief abstract of their remarks is here appended:—

Mr. S. J. NICHOLL, *Associate*, noticed that Mr. Seddon had urged that the font should be raised upon some steps; but the older practice was to sink it, with the idea that as, symbolically, men are born again in baptism, so they should descend to the tomb first. If some of the pulpits abroad were too large and ornate, thereby rendering the preacher insignificant in appearance, it should be remembered that they were designed to enable the Bishop to preach in them attended by his Deacons, who stood with him in the pulpit, and in his episcopal vestments he would not be eclipsed by any magnificence in the architectural accompaniments. The pulpit of the "wine-glass" shape might have obtained its form and height from the fact that access to it was often from the rood-loft or the stairs leading thereto; in Hutton Church, Somerset, a stone pulpit, attached to the wall on the north side of the nave, was approached by stairs through the door which also led to the rood-loft. He did not think that a reredos was necessary, as stated in the Paper, when the altar was placed in an apse away from the wall, for the ancient altars which were so placed had at first no reredos. Communion rails were prescribed by St. Charles Borromeo to be "communion benches," which, in the speaker's opinion, might be found more advantageous than the mere rail now in use. He thought that a certain number of seats should be made easily removable, and referred to the facility with which, in Continental churches, the chairs are often turned round during the sermon, so as to face the preacher. He was in favour also of the lifting-seats for stalls, and did not despair of their coming again into use, as they afforded rest during the long services in Holy Week, when all were obliged to stand.

Mr. R. H. CARPENTER, F.S.A., *Fellow*, referred to the bronze fonts he had seen in the churches of Hildesheim and Bremen, which in each case were surrounded by a screen of iron and brass work, and so designed that the priest and the sponsors could go up and stand around the font. There was an analogous English example at Luton, where the fourteenth-century font with its baldachin-like canopy was surmounted by a stone spire, and screened around. As regarded steps down into the font, in some of the ancient Coptic churches of Cairo, at the west end of the nave, there was a descent of three or four steps. In those Coptic churches one could see, behind the screen, the altar in its original position and the seats around the apse. When the priest gave the blessing from the eastern side of the altar he would not have been seen had there been a reredos. He thought that the application of the eagle form to lecterns was derived from the early Italian pulpit desks; and wished, in conclusion, that Mr. Seddon had shown a form of seat to be avoided, which would have been a useful study for them.

Mr. E. J. TARVER, F.S.A., *Fellow*, said that for seats he had succeeded in obtaining a convenient shape, by cutting out a jointed model of the human figure, and, after placing it in a comfortable posture, drawing the seat to fit it.

Mr. WM. WOODWARD, *Associate*, would have liked, in the matter of seats, to hear that provision was made for hats and umbrellas; in attending church, the result of placing one's hat on the floor was that it was frequently kicked, and always soiled by dust. He thought the Continental system of using chairs objectionable, as the noise created by moving them was detrimental to the attention which was desirable in the services of the Church, though in the side chapels they were necessary and convenient. He objected also to tile-paving because of the noise it occasioned. He then referred to the mistake of placing the organ in an organ-chamber, and instanced the position of the organ in Hampstead Church as a good one; and he considered the bench-ends in that church, which were designed by the late Frederick P. Cockerell, beautiful examples of classical treatment.

The PRESIDENT said that, having recently spent some weeks in Spain, he had remarked upon the noble proportions of the churches there, and how they were clear of seats. The Spanish people seemed to get on very well without seats, and the congregations, largely composed of men, were extraordinarily attentive, even during long services. The men for the most of the time were on their knees, and the ladies sat on the ground. On coming back to English churches, there seemed to him something mean and despicable in the seats with which they were filled.

LXXII.

GERMAN TECHNICAL MUSEUMS. By Frank Granger, M.A. Lond.,

Associate, Holder of the Godwin Bursary.

Mr. Alfred Waterhouse, R.A., *President*, in the Chair.

Mr. President and Gentlemen,—

In accordance with my undertaking as holder of the Godwin Bursary for 1889, I spent the end of August, September, and the beginning of October of that year in visiting some of the Technical Museums and Schools of North Germany. My tour, which included Hamburg, Berlin, Dresden, Chemnitz, Leipzig, and Hanover, occupied six weeks. Following the graceful precedent set by previous holders of the Bursary, I would pay a tribute of thanks to the memory of its founder. I would also acknowledge the great courtesy of the directors, professors, and other officials of the institutions which I visited. Owing to the fact that my visit partly coincided with the summer vacation, I was compelled to trespass on their kindness to an especial degree.

The class of buildings selected for study deserves the careful attention of architects, now that so much interest is being taken throughout the country in technical education. Moreover, during my absence in Germany, the Technical Instruction Bill of Mr. Mather became law,* and is being put in force in various districts. Hence architects may expect to be called upon to adapt the buildings which already exist, and to erect new schools in which technical instruction may be given. One of the directions in which the Act will probably be applied is in reference to evening continuation schools for workmen. Accordingly, I have noted provision made in Germany for this purpose so far as it came under my observation.

As to the general arrangements of large technical schools, and especially of physical and chemical laboratories, Mr. Robins and others have collected much valuable information.† My attempt, therefore, has been rather to supplement in this particular what has already been done than to cover the whole of the ground afresh.

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* It received the royal assent August 30, 1889.—F. G.

† See Transactions, 1883–84, pp. 5–24.

My report includes some items of more general interest, especially with reference to heating, ventilation, and drainage.

But the chief object of my tour was to study a class of museums which is much better represented in Germany than in England: I refer to the Technical Museums. It is difficult to hit upon a word which shall call up the right idea: under the name suggested I include all collections which are employed to aid and supplement technical instruction. This purpose is rarely lost sight of, and is perhaps the characteristic which most powerfully impresses an English visitor. From this point of view there is very little difference between the numerous collections in the various polytechnics and those in the ordinary museums; they have been treated together in the following pages. In many cases those collections are not accessible to the general public, and no catalogues are published. Parts of my report, therefore, are devoted to brief enumerations of the objects exhibited, in order that a clear idea may be given of their requirements in the way of accommodation, fittings, &c. It has been impossible to avoid considering one or two points which lie a little outside the architect's immediate province: in order to plan any class of building satisfactorily, he must be able to enter into the views of his clients. Hence the digressions which may at first sight appear irrelevant.

The industrial-art and the trade museums of Germany have been suggested in great part by our own South Kensington Museum; the directors of similar institutions at Hamburg and Berlin acknowledged this indebtedness to English precedent. Hence these German museums call up reminiscences of what has been in England in imitation of the South Kensington model. Closer inspection, however, reveals some essential differences. In England the use of such collections for technical instruction has a powerful competitor in their use as galleries of fine art. Oil and water-colour paintings and pieces of sculpture are housed together with products of the arts not fine. This arrangement is probably the best in ordinary cases where neither part of a provincial collection is large enough to demand a separate building. On the other hand, the German practice is frequently to locate the industrial-art museum in a school building, as at Hamburg and Dresden. This subordination of industrial-art museums to technical instruction gives rise to one or two details of importance. For instance, antique objects are introduced where necessary in order to show the earlier methods of an industry. Thus at Hamburg the first stand in the pottery rooms is occupied by Greek and Roman vases. At the other extreme, modern specimens are put side by side with the older ones in order to show the processes of the present day. Modern pottery, glass, wall-papers, textile fabrics, form part of the collections at Hamburg, Berlin, Dresden, &c. Then, again, the various processes of reproduction are employed without scruple where necessary or advisable in order to complete a collection. Some classes of objects are naturally limited in number, and even where funds are available cannot be purchased, all having been previously bought up. Others, again, involve a greater outlay than most institutions can afford. In these cases no scruple is displayed in the use of electrotypes, plaster casts, &c. In a word, the museums are

regarded from the student's point of view, not that of the collector of curios. This is a matter which concerns museums generally, and the Germans have not hesitated to carry it out to its legitimate conclusion. In the royal museums at Berlin antique sculpture is represented as much by plaster casts as by originals. The case is the same with painting; in the Leipsic Art Gallery a place of honour is given to a copy of Raphael's Dresden masterpiece. The ground floor of this last-named building is occupied with plaster casts, which are carefully arranged with a view to their individual effect. This principle is applied, though in a less striking manner, to the industrial-art museums, and should be borne in mind in arranging the accommodation.

There is an allied class of museum of which the trade museum at Chemnitz may be taken as a type. The point of view here is rather that of the manufacturer and the merchant than the designer. The objects exhibited in the Chemnitz museum are chiefly samples illustrating the various stages of manufacturing processes, and consist of porcelain, silk, cotton and woollen goods. Side by side are found examples of the materials and methods employed in the building trades.

Turning from the general character of these museums to the classes of objects exhibited in them, the following points deserve consideration. It is obviously advisable, in industrial-art museums, to group objects of one kind together, in order that the methods characterising an artist, or group of artists, a district or a period, may strike an observer more forcibly. With this view objects of one kind should be arranged as far as possible so as to be seen in combination at a single glance. The division of rooms by partitions and screens, as at Berlin and Hamburg, serves as a means to this end. Characteristic collections of wrought iron occupied the compartments of one room at Hamburg. With the same view Dr. Brinckmann, of the Hamburg Museum, limits his purchases each year to some specific class of industrial products, so that it may be possible to obtain these general effects. The size of the textile examples is, on the same principle, sufficient for two or three repetitions even of very large patterns; they are often eight and ten feet long.

In other collections considerations of artistic history have no influence, and they are best arranged when the nature of the materials and the methods of production are respected. Suggestions of the following nature may seem a trifle pedantic, but they are, perhaps, not without their use. It will be found that the difference between organic and inorganic substances is reflected in the great divisions of industry. Building, civil and mechanical engineering, are chiefly concerned with iron, lead, brick, stone, glass, &c.; wood being the chief substance that interferes with the neatness of this classification. The industries concerned with clothing deal with animal and vegetable products—that is to say, leather, cotton, wool, silk, &c. And so, in planning a trade museum, it will be appropriate on scientific as well as on practical grounds to group together, first, the materials employed in the industries of construction; secondly, the materials employed in the textile and allied industries.

It will be found that the proper illustration of trade processes demands the use of models of machinery, &c. The Chemnitz Trade Museum was inadequately supplied

in this respect. For this we must turn to the collections in the great Technical Schools. A reference to the description of the Charlottenburg Technical School will show what an important place is given in Germany to this branch of educational equipment. Here the objects exhibited are arranged in collections, each of which is attached to the corresponding department of the school. These include a magnificent series of models of machinery; models of special kinds of factories; specimens of the raw products employed and their manufactured form; in addition, the materials and processes employed in building and civil engineering occupy several large rooms.

There are one or two other museums, notably the Mining, Agricultural, and Hygienic Museums of Berlin, which show what can be done by specimens, models, and charts to illustrate special branches of applied science. In this respect they resemble the collections in the Polytechnics.

By means of the hints to be obtained from the last-mentioned class, we can form an idea of a complete industrial museum. Since its object is primarily to illustrate industrial processes and the applications of materials, the artistic qualities of objects must not take precedence over their suitability for aiding technical instruction. The various stages in the manufacture of silk, cotton, woollen goods; of brushes, ropes; of pottery; the processes of tanning, dyeing, enamelling, and lacquering may be easily illustrated by sets of samples. Another group of objects might illustrate the uses of iron, copper, tin, zinc, &c., as in the side cases of the mineralogical collection, Charlottenburg: and the same remark applies to the uses of chemicals like sulphur, manganese, chlorine. Questions of strength, durability, &c., may be answered by reference to materials which have undergone certain tests. Specimens of iron, cement, and other materials after the application of such tests must find a place. And in order to the completeness of a museum of this kind, the best appliances to secure the health and safety of individuals employed in manufacture should be illustrated. Photographs of the effects of colliery, boiler, and gas explosions, illustrations of the dangers of lead, arsenic, copper, and other poisons, will give a reflected interest to the appliances and tests for the prevention of such disasters. The results of analysis are often exhibited in German museums in glass bottles containing the several constituent parts in their due proportion. Further, simple tests by which adulteration may be detected can be illustrated in the same way. The excellent collections at the Agricultural School, Chemnitz, show what can be done in this direction for farming processes, and that, too, without great expenditure of money or space.

Maps, charts, and models may be used with advantage to illustrate and supplement these specimens. Maps and charts are often used to illustrate the distribution of natural products over the earth's surface, or to symbolise statistics in a comprehensible form; thus a chart in the Agricultural Museum, Berlin, showed the proportionate exports and imports of farm products for the countries of Europe. Photographs may be used, in the way already described, to record catastrophes. They are especially useful to show the state of the materials employed in old buildings, the appearance of quarries, the scaffolding and methods of construction employed in great engineering

works ; the machinery and the fittings of workshops. We are well enough acquainted in England with this sort of appliance, though hardly ready enough to make use of it. With respect to models of all kinds, however, much may be learnt from Germany. These are used to a quite surprising extent. To take an instance of special interest, the architectural collections in the Polytechnics of Berlin and Dresden contain models of many of the buildings which are illustrated by the architect's drawings preserved in the adjoining drawers. And these are made more useful by the full-size details of portions of the façades, which enable the mind to picture the actual effect of the whole. Further, the various methods of building and engineering construction are illustrated at Charlottenburg and elsewhere by numerous models exquisitely executed ; especial attention is given to the models of factories, workshops, mills, &c., for special purposes.

An interesting and important use of models was to be seen in the papier-maché representations of horses, cattle, sheep ; fruits, roots, &c., in the agricultural collections at Berlin and Chemnitz.

Such, then, being the objects that have to be exhibited, we now come to the practical questions which concern the architect. These are, or may be reduced to, two in number : first, what principles must be adopted in planning such museums ; secondly, what kinds of cases and screens are required for the exhibition of the specimens ?

With reference to the planning, every technical museum visited by me had a school in connection with it, and the museum was in at least half the cases subordinate to the school. All the buildings of this class were characterised by great simplicity of plan. The rooms were square or oblong, and arranged along corridors, and, generally speaking, there was an absence of *tours de force* in the planning. In some of the larger buildings, as at Hamburg and Charlottenburg, the corridors overlooked interior courts. An alternative arrangement was that of the Industrial-Art Museum, Berlin, where the rooms were grouped round a covered court with glazed roof. The broad corridors were used for the exhibition of objects both at Charlottenburg and Hamburg, so that the space occupied by them could not be regarded as wasted.

It is obviously important that the rooms in a museum should open out of one another in such a way that the visitor can go from one end to the other without a break, and it is desirable that after going the whole round the visitor should find himself where he started, so that he has not to retrace his steps through rooms already traversed. The number of each room should be marked in large characters above the doorways, and arrows may be used with convenience on the door-jambs, in order to show the visitor which room he is leaving and which he is entering. This is done at the Hygienic Museum, Berlin. It will be for the curators of such institutions to group their collections in such a way that the objects may be seen in their proper order.

One or two special points may be noticed. The rooms in which textile objects are exhibited should not have the sun upon them. It will, further, be necessary to make careful arrangements for their study, since they form a class of object especially important for designers. Moreover, but a small proportion of an ordinarily large collection can be exhibited at one time. Hence accommodation must be provided for their storage

in such a manner as to be easily accessible, and the textile rooms should be provided with large flat tables on which the specimens can be laid.

A library and reading-room should be provided in connection with each museum; this was done, almost without exception, at all those which I visited. At the Industrial-Art Museums, Berlin and Hanover, these rooms were on the ground floor. In many cases, as at Dresden and elsewhere, they were on the top floor In addition to the ordinary book-shelves the library of a technical museum should be amply provided with drawers or cases for photographs and prints. A useful detail of the Berlin library was the shoeing of the readers' chairs with indiarubber. The noise was thereby much diminished. Hats and cloaks should not be admitted into such a library; the dust they bring in and the disturbance of taking off and putting on will render advisable provision of pegs in the adjoining corridor. It should not be necessary to pass through the museum in order to reach the library. The valuable character of the objects, books, and prints contained in these collections will suggest the provision of lavatories in the neighbourhood of the library, both for the comfort of the students drawing or reading, and the better preservation of the books and objects handled by them.

Generally speaking, these museums are opened to the public but a few hours a day, and often not more than one or two days a week. The Chemnitz Trade Museum, for instance, is open from 10 to 12 on Sunday mornings only. In the majority of cases a small charge is made for admission. This arrangement allows the student to work without fear of interruption; it has a practical interest for the curators and also for the architects of such museums, for the small amount of traffic gives rise to less dust. Consequently, many objects which we are accustomed in England to see under glass are left exposed in Germany with comparative impunity.

Notwithstanding, the great majority of the objects in a museum will require accommodation in glass cases of various kinds. As to the materials to be employed, the choice rests between wood and iron: and the general opinion of the museum authorities with whom I conversed was in favour of wood. In many cases the frames for the glass were made of iron; but even this limited employment of metal has been objected to at Berlin, on the ground of the difficulty of keeping it dust-tight. The choice of wood varied between oak (at Hamburg), mahogany, walnut, and the commoner kinds. Maple was used at Berlin, and painted black. The interiors of the cases, especially for scientific specimens, were painted white; one or two which had been stained and varnished were failures. The material used for the lining of the cases in the industrial museums was often baize, red-brown as at Berlin, claret-coloured at Dresden. In the latter place dark-brown velvet was used where there was no direct sunlight. This, of course, formed a good background for the examples of jewelry. The advantage of these stuff linings is, that nails can be driven in or removed without disfiguring the surface so much as if it were varnished or painted. The dimensions of the cases are limited on the one hand by the distance to which it is convenient to stoop, on the other by the height at which objects can be seen with ease. The distance from the floor to the underside of the desk-shaped cases usually varied between 2′ 4″ and 2′ 8″; the height of the upright

cases did not ordinarily exceed 7′ 0″. In arranging the fastenings, it is important to combine the maximum of security with the minimum of inconvenience to the head officials, who will, naturally, require on many occasions to have recourse to the cases. With this view, at the Industrial-Art Museum, Berlin, each minor official is furnished with a latch, by which he can lock the cases when once opened, but cannot unlock them. The head officials alone are provided with keys to open the cases. The arrangement adopted at the Chemnitz Technical School is good: in each room devoted to a collection a small cupboard is fixed to the wall, in which the keys for the cases in the room are hung. These cupboards are kept locked, and the officials alone are in possession of keys that will open them. One key is thus sufficient for a large number of cases.

The dimensions of the materials used should be the least consistent with safety in those parts of the cases where the objects are placed. Some of the examples that came under my observation suffered from their heavy proportions. If the bottoms of the cases and the supports are made substantial, so as to give a firm basis for the portions used for exhibition, there will be little need of a heavy superstructure. One means of lightening the appearance is to use iron bearers to carry the shelves, and to fix them at each end in upright iron bars. This leads to the next point—the material employed for the shelves. Plate-glass is advisable on several grounds; it need not be very thick, and its transparency enables the underside of objects to be seen. On the other hand, it is fragile and expensive, and sometimes gives rise to confusing reflections. When wood is employed it should be selected with great care in those instances where great weights have to be carried. The plan of arranging broad and narrow shelves alternately is a good one. Objects of different heights can be grouped together without loss of space. The glass for glazing should be strong, in order to protect the objects from intentional or accidental damage, and clear, in order to permit the objects to be properly seen through it. An inferior quality had been used in one or two collections that came under my notice, with the result that many objects appeared blurred. Plate-glass should, therefore, be used; there is no need, however, to adopt a refinement introduced into the Industrial-Art Museum, Leipsic, where one case was glazed with bevelled glass.

Different forms of cases are suited to the sides and centres of rooms respectively. Nearly all the different kinds may be reduced to combinations of upright cases, and what I have ventured to call "desk" cases. For the sake of the general appearance it is well to follow one system of dimensions and mouldings throughout: the Hamburg and Berlin Industrial-Art Museums furnish examples of this. Very often a centre case corresponds to two side-cases placed back to back. The space under each window may with advantage be filled with a desk case, as at Dresden. Although the combination of "desk" with upright cases is a favourite one in Germany, it is open to the objection that the visitor can only get a close view of the objects in the upright part by leaning forward over the "desk" case. On the other hand, the interposition between two desk cases of an upright screen on which textile specimens are placed, as at Chemnitz, is suitable, because those are better seen a short distance away. This

arrangement has the further advantage of dividing the rooms into sections, as at Hamburg.

The exhibition of textile specimens demands abundance of flat wall space. It is a waste of money and room to put them under glass cases of any of the patterns just considered. They should be framed and hung on wall surfaces. For the purposes of study, and in order that the specimens exhibited may be changed from time to time, it is important that the backs of the frames should be easily removable.

Cupboards for storage are occasionally provided below the upright cases; or, again, the space below the desk cases is utilised for drawers, as at Chemnitz Trade Museum. When space is limited, or when it is desirable to keep classes of objects together for convenience of reference, such arrangements may be recommended. On the other hand, the general appearance of museums is more elegant, and the dust has less chance of accumulating, where the spaces in question are left free.

There was an interesting wall case at Charlottenburg Technical School, the front of which, instead of being straight, was brought forward in the centre, where the two halves of the front formed an obtuse angle. It stood against the wall between the windows. By this arrangement the objects in the centre of the case could be brought forwards in order to catch some of the side light from the windows.

In the other branch of my subject, "Trade Schools," I have less to report. As to the Technical High Schools or Polytechnics, I limited myself, for reasons already stated, to the collections and one or two details. A few remarks on electrical laboratories will be found with my notes respecting the Charlottenburg and Hanover Technical High Schools. One could not help feeling that the electrical departments failed to receive the consideration they deserved. The rooms were not arranged, at Hanover at least, with much adaptation to the requirements. Of course, the dynamo room, owing to the weight of the apparatus and the high speed of working, must always be on a solid foundation, and therefore in the lowest storey. If worked by steam power, it must be near the engine-house. Gas-engines, however, are more convenient. Another room which may suitably be put in the basement, is that devoted to the collection of surveying instruments. A steady foundation is thereby obtained as demanded by certain experiments.

The fittings for drawing rooms vary somewhat from those ordinarily used in England. Tables for mechanical drawing are preferred flat. The lithographer's desk has an open frame on which the draughtsman rests his arms. The block shown [fig. 102, p. 212] is movable in one direction only: an improved model had a revolving block.

In addition to the technical high schools, I visited some institutions devoted to special occupations, as the mining and agricultural schools of Berlin, the agricultural and weaving schools of Chemnitz. The agricultural school of the latter town was chiefly interesting for its complete collections of educational appliances. In the weaving schools the fittings were very simple, with the exception of the numerous examples of hand- and power-looms. The steam-engine was in each case in the

basement, the power-looms being on the ground floor. Here it is important that dust should be excluded.

Another important class of technical institution is referred to in my report, namely, the trade continuation schools. They are interesting because they indicate one way in which the new Technical Instruction Act may be applied. In these schools classes are held on Sunday mornings, and at night on one or two week-days. With a few exceptions, the buildings employed belong to public elementary day-schools: the exceptions are constituted by the evening classes of the schools of industrial art, as at Hamburg, Dresden, &c. It may be expected, therefore, that the Board schools and other elementary schools throughout the United Kingdom will be much used for such purposes. The chief difficulty in the way arises from the fact that the fittings of elementary schools are inconveniently small for older students. The fact, however, that buildings are ready to hand outweighs this disadvantage. Under any circumstances, these technical evening schools will require some appliances beyond those of the day-school. Easels for modelling in clay or wax, and chairs for drawing from models, are provided in many German schools. Moreover, cases will be required for plaster casts, models of machinery, joinery, architectural detail (for masons), and wrought-iron details. Cupboards for the drawing-boards and other materials of the students are often provided.

The school buildings are usually three or four storeys high, and planned with the same eye to symmetry as the museums. The new buildings are on the same model as the old ones. The staircases and corridors are broad. The latter ordinarily give access to class-rooms on one side only, and on the other adjoin an open space, generally the playground. There is a remarkable absence of cunning contrivances for throwing class-rooms together, such as the glass and other partitions used in some English schools.

TECHNICAL MUSEUMS.

Industrial-Art and Trade Museums.—Hamburg possesses a magnificent educational building which was opened in 1876. It was erected from designs by Zimmermann, at a cost of 120,000*l.*; the fittings cost 7,500*l.* As will be seen from the ground plan, it forms a closed quadrilateral with two interior courts, which are separated from one another by a central block. The chief elevation looks towards the east. The greatest length of the building is 343′ 0″; the greatest width 247′ 0″. The large hall or "aula" is in the centre of the main (E.) front on the first floor. The rooms of the trade school and of the school for the building trades lie for the most part to the north and east of the first and second storeys. The porter's living-rooms, several rooms belonging to the chemical laboratory, and a room for casting in plaster, are in the basement. The entrance to the trade school is at the north-east corner, the approach to the "aula" in the centre of the east front. With the exception of the rooms in the middle block, all class-rooms are approached from a corridor directly adjoining the open courts.

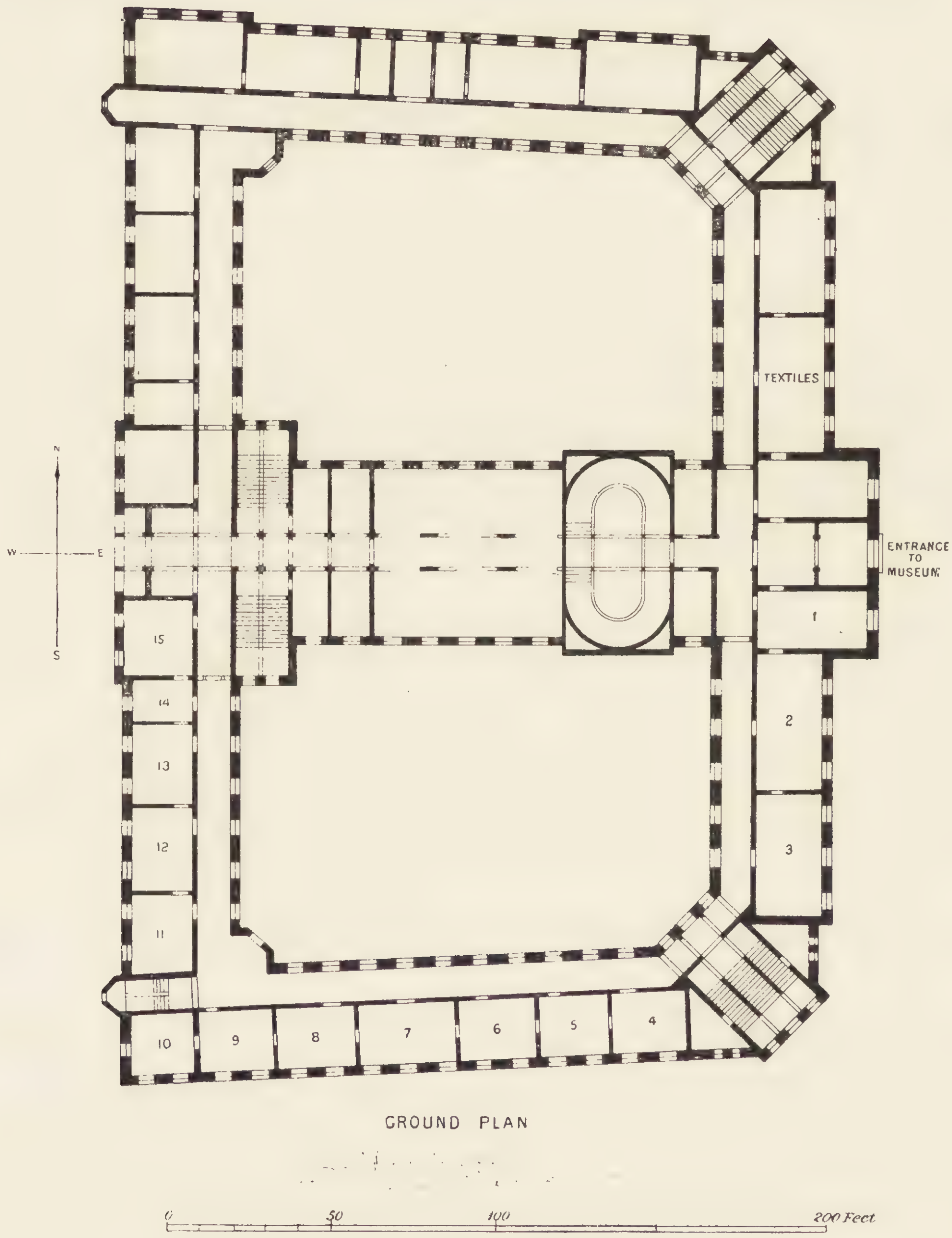

Fig. 95.—Hamburg Trade Museum.

The south part of the ground floor is devoted to the museum.* The first room to the right on entering is devoted to wood-carving from buildings in Hamburg, and

* It is called a "trade" museum throughout for the sake of symmetry; the school connected with it could not have been called "industrial" without arousing wrong ideas. The two institutions both go under one name, "gewerbliche."—F. G.

to the porcelain stoves, a local product of the last century. The room beyond is devoted to the textile exhibits. These are for the most part preserved in cases. The rooms to the left on entering are occupied, taking them in order, first by wrought-iron work in rooms 1–3, also in the adjoining corridor. Glass exhibits are in the same corridor; Greek and German pottery in 4; German stoneware and majolica in 5; Faïence from Delft, Rouen, &c., in 6; German, Alsatian, Swedish, Faïence, Japanese, and Chinese porcelain in 7; Persian Faïence, works in enamel, and Oriental works in metal in 8; works in the noble metals and bronze in 9. In the adjoining corridor wood-carvings, works in ivory, lacquer, and leather are exhibited. The furniture of the sixteenth–eighteenth centuries is arranged in historical order, and includes the furniture of a Hamburg merchant's drawing-room of the last century, with the carved panelling which covered the walls. These are placed in rooms 11–15 [fig. 95].

The principles of arrangement are said to have been as follows: *—" The main " groups of objects are arranged from a technical point of view; within these technical " divisions the arrangement depends sometimes on historical or geographical con " siderations, sometimes on decorative effect. This varies as the kind and amount " of the material to hand renders one or the other method the most instructive. In " the few cases where this arrangement has been broken through it has been sought " to give select objects a place favourable to their proper treatment. The exhibition of " objects according to their position in the history of art has rarely overridden respect " for technical considerations."

In some rooms the walls opposite the windows were divided by partitions 11′ 6″ high, which came out into the centre of the rooms about 8′ 0″, and so formed compartments suitable for the exhibition of objects of one class, period, or locality.

The glass cases were of oak unpolished, and were rather heavy. The authorities would have preferred ebonised wood or mahogany. The shelves were covered with claret-coloured baize. The flat tops of the cases were used for objects. The case for the textiles was also of oak; the shelves were movable. The frames for mounting the examples were 2′ 0″ to 2′ 9″ wide, sometimes 9′ 0″–10′ 0″ long, with $\frac{3}{4}'' \times 2''$ sides and ends, $\frac{3}{4}'' \times 1\frac{1}{2}''$ cross pieces.

Industrial-Art Museum, Berlin.—This building is situated near Königgrätzer Strasse and adjoins the new Ethnological Museum. It was opened in 1887, and is from designs by Gropius and Schmieden [figs. 96, 97]. It is constructed with stone basement and brick superstructure, with tile and terra-cotta bands. The panels between the windows of the top storey are filled with mosaics representing the principal epochs in the history of civilisation. These are by Salviati from the designs of Ewald and Geselschap. The cost was 131,000*l.*

The plans of ground and first floors are given [fig. 96]. The objects exhibited on the ground floor consist of furniture and wood fittings, wrought-iron work, works in paper, leather, mosaic, &c.; on the first floor, of pottery, glass, and metal. The textile collec-

* Report, 1882, p. 119.—F. G.

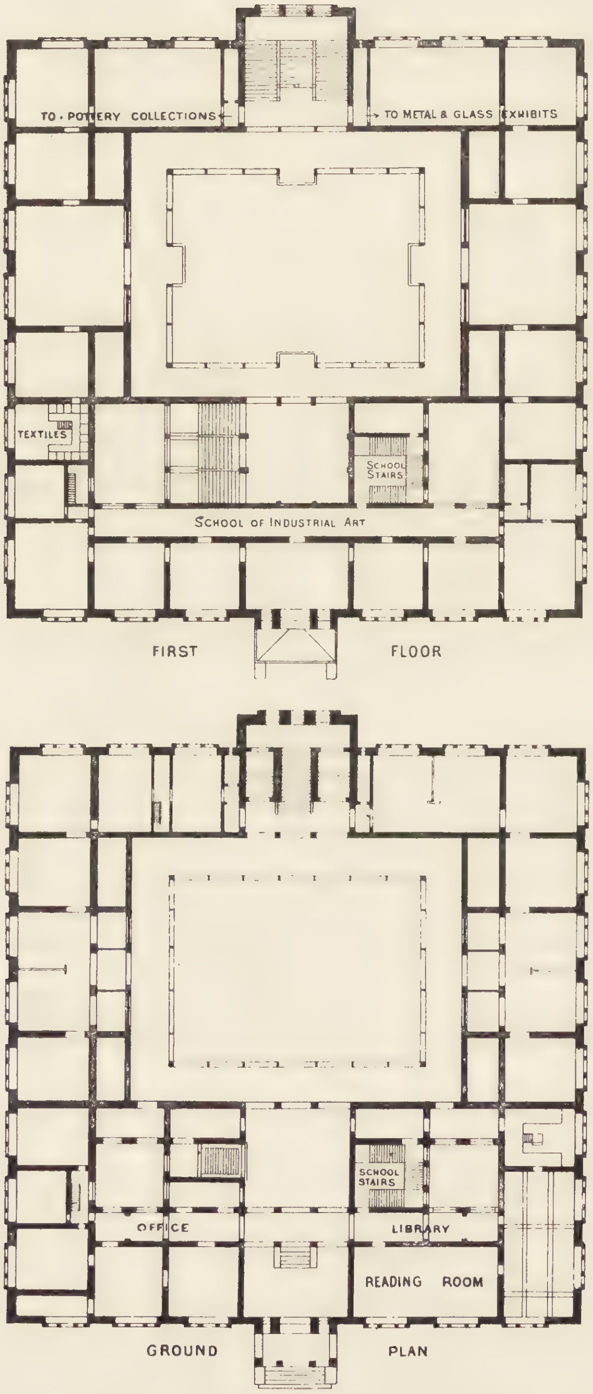

Fig. 96.—Industrial-Art Museum, Berlin.

tion is kept in a room reserved for students. A few cases in the public part of the museum contain specimens which are changed from time to time.

Drawings of the cases have been published by Wasmuth of Berlin.* It is claimed that they represent the outcome of many experiments. "The material "selected for the cases is wood "throughout. Experiments with "iron cases have shown their "unsuitability for industrial art "collections. Iron casements "were rejected, since it is im-"possible, where they are con-"tinually used, to keep them "dust-tight. The cases are of "maple ebonised and slightly "polished. Black was chosen, "since it stands in a neutral "relation to most objects. The "strength of the wooden frame-"work is limited to the barest "proportions, since the plate "glass, which is the exclusive "material for glazing, helps to "support it. The interiors of "the cases are constructed of "pitch pine, and lined with "reddish-brown baize. This "stuff lining has the advantage "that nails and screws can be "used to secure objects in their "places without leaving visible "traces. The height of the "shelves is calculated for visitors "of medium height, so that "objects can be drawn without

lasschränke u. Ausstellungs-Vorrichtungen im Königlichen Kunstgewerbe-museum zu Berlin. 1886.

"removing them. All cases can be opened with one key. A latch in the possession "of each attendant can secure the doors. Thus, while the chief officials are alone "equipped with keys, they are not compelled to keep locking the doors while they are "at work, since the subordinate officials are provided with these latches."

The objects are grouped with a view to practical purposes. They are arranged so as to give the clearest possible conceptions of the methods of working and the ornamental "motives" in vogue at each period and place. Thus, one case shows the stages in making Japanese lacquered goods: the raw materials, tools, favourite subjects

Fig. 97.—Industrial-Art Museum, Berlin.

used for ornament. In another place a similar series was set out illustrating the materials and methods employed in mosaic decoration.

Antique examples are used only so far forth as they explain the development of an industry. Thus a few select examples of antique glass have been brought from the Old Museum. On the other hand, objects recently produced form part of the exhibition. Among others were some examples of tiles by Simpson. The collection was further completed by the use of plaster casts and electrotypes where originals could not be obtained.

The examples of textile fabrics, paper, &c., were usually of a sufficient size to permit the pattern, however large, to recur once or twice. The objects were left exposed

on walls above doorways, &c., to a greater extent than customary in England, and they were put as far as possible in their natural position. The beautiful examples of furniture were grouped so as to give the impression of apartments of their several dates, and the decoration of each room reflected the character of the articles it contained.

The second, which is the topmost floor, and part of the first floor, are devoted to a school of applied art, where instruction is given in decorative design, modelling, engraving, the designing of wall papers, textiles, artistic embroidery, &c.

The library is on the ground floor to the right of entrance. A room in the basement contains a large collection of photographs, drawings, &c., which are kept in drawers. Broad tables are provided here, covered with leather, on which prints, &c., can be laid for inspection.

Dresden Museum of Industrial-Art.—This is in the same building as the School of Industrial-Art and under the same supervision. As at Hamburg, the rooms devoted to the museum are on the ground floor; the school occupies the upper storeys.

The cases, stands, &c., were of a simple practical character. The lace specimens were exhibited in two tiers on the top of the long cupboards, provided with sliding doors, which contain the lace collection. The examples exposed to view are changed from time to time, the backs of the frames being easily removable. Other textile specimens were on screens about 9′ high, running across some of the rooms. As only a small proportion of them could be exhibited at one time, the great majority are kept in cupboards. Pieces of Japanese stamped paper were fixed on the walls. Among the many objects which were exposed to view without protection were some articles of Eastern costume, set out on milliners' lay figures.

Small or flat objects, such as jewelry, porcelain cups and saucers, were arranged in the desk-cases, on movable flat boards which could be brought within any desired distance of the glass. Those objects which require a background to set them off were put on dark-brown velvet. Cases exposed directly to the sunlight were lined with claret-coloured baize.

The collections were supplemented by antique specimens, as, for instance, jewelry from Pompeii. Electrotype reproductions were used to complete the collection of bronze, silver, and gilt vessels. Among the modern productions were some tiles manufactured by a Shropshire firm.

The hot-water pipes were fixed against the windows of the museum, and desk-shaped cases were put above them.

The arrangement and fittings of the library and school were of the simplest possible description: the library and reading-room were in the second storey. The remainder of the first and second storeys was occupied by the school. Ordinary chairs, flat tables, shelves, and easels were used without any special adaptation to their use in such a school.

Leipsic Industrial-Art Museum.—The visitor has to turn under an archway off a street against the Thomaskirche, through a small courtyard, up an old flight of stairs, into the museum. This occupies about a dozen rooms on the first floor of an old

building. The rooms are not more than 10′ 6″ high. The objects exhibited were similar to those already described as exhibited at Hamburg, Berlin, and Dresden.

In many respects the disposition of the objects was very good. The cases were black, and although they absorbed perhaps more light than the rooms could spare, they looked effective. The design of one of them was too elaborate: the fantastic carved legs and ornaments competed with the objects inside for the visitor's attention. The glass need not have been bevelled. The stands for textiles were the most successful. The arches and recesses round the windows were left without wood-finishings, and simply plastered: the plain surfaces were used to fix objects to. Tiles were arranged on the jambs and sills of one or two windows with good effect.

Hanover Trade Museum.—The Trade Museum at Hanover is housed together with a school of industrial art in a building which was formerly a private residence. The library and reading-room are on the ground floor, the museum on the first floor, the school on the second floor.

Chemnitz Trade Museum.—The Trade Museum at Chemnitz was the best example of its class that I visited in Germany. It is in connection with the local "Handwerker-" verein," and occupies the second storey of their building in the Herrenstrasse. The floor below is devoted to their library. The museum consists of four rooms opening into one corridor, while the further corridor leads to a fifth room and a small library containing a few illustrated works on industrial art for reference. With the exception of this last, all the rooms are well lighted.

The museum contains in one room a long wall-case in which are specimens of jute spinning, showing the raw material and its stages while being converted into sacking; wool after undergoing various processes; silk cocoons at various stages of development; flax. On the wall are lace curtains and Persian carpets.

The following objects are exhibited in a second room: jacquard cards, natural dyes, stages in the manufacture of worsted yarn, of india-rubber goods, of paper; stages in silk, worsted, linen, cotton, and jute weaving; stages in the manufacture of velvet. On the tables against the windows are textile specimens on cards for close inspection.

The third room illustrates the decoration of interiors. Nothing interferes with this purpose. The elaborate dado, wall, and ceiling papers, the stained-glass window, the stove enclosed in Dutch tiles, are all that meets the eye here.

The fourth room has the same central cases as in the second, but without any central wood partition above the sloping surfaces. Among the objects in this room are specimens of wood on cards as at Charlottenburg—wood carving, wood mouldings, wood models. There are also specimens of marble, ozokerite, the materials employed in porcelain manufacture, the tools required in various trades, also of locks showing construction. Further, there are specimens of rolled iron showing the effects of various tests; of metals and alloys, the proportions being shown. The iron trade is further illustrated by specimens of ores, of manufactured goods, including some articles in cast steel.

The last room, among other things, contains the materials employed in brush manufacture, from the raw material to the finished product. A large case at one end of the room contained the bark and other materials employed in tanning, also large specimens showing the different stages in the manufacture of calf-skin and artificial sole-leather.

The adjoining corridor contains mining products, models of lightning conductors, specimens of Meissen granite. The long corridor contains specimens of rolled iron, bricks, tiles, and terra cotta; glass, showing its various applications in building; Portland cement, cement as available for use in colour-decoration (in various coloured mouldings, &c.). In addition to these objects were a number of models of lifts and other details in buildings applied to special purposes.

The arrangement of the museum is open to a little criticism from its want of system. While in many of the cases industrial processes are kept strictly in view, others are merely manufacturers' advertisements. Again, the same classes of objects are distributed in different portions of the museum. The textile fabrics are in smaller pieces than at the Industrial Art Museums in Hamburg and Berlin. A few are foreign or antique, the majority modern and German. These points and the comparative absence of models are probably due to the fact that the museum does not stand in immediate connection with a teaching institution.

Mining Museum, Berlin.—The Museum for Mining and Smelting is attached to the School of Mines. The building is similar in elevation and plan to the building in which the Agricultural Museum is housed. In each the museum fills a central court and the gallery running round the same.

The Mining Museum includes specimens of metals, &c., showing the various stages in their production, together with models of the buildings and machinery employed. Sometimes these models are replaced by large wall-charts showing the buildings, &c., required. Other charts illustrate mining statistics, as, for instance, those which relate to the output and consumption of various minerals throughout Prussia. The cases showing technical applications of materials are placed in the middle of the court; the specimens of ores, &c., round the side. The interiors of the cases are painted white. They are flat, and stand 4′ high, made up as follows: legs 2′, drawers 1′ 3″, top of case 9″. While some cases showed specimens of various metals, iron, tin, copper, &c.; other cases contained the articles made from them, agricultural tools, military weapons, building fittings, all being grouped according to the materials of which they were made. In one place, round steel wire $\frac{1}{8}''$ diameter was shown under a tensile strain of 500 kilos. Specimens of bar iron from various places in Prussia showed the effects of certain tests.

The gallery contained specimens of marbles, building stones, the clay used in brick and tile manufacture. The marble was further shown worked up in various combinations. An interesting geological model was constructed of sheets of glass placed vertically at right angles to one another. On these sheets  PLAN the contour of the corresponding section of land was marked. Geological maps and

sections, together with dried botanical specimens corresponding to the coal fossils, were placed with the coal specimens.

Agricultural Museum, Berlin.—The ground floor of the Agricultural Museum is devoted to rakes, pitching forks, spades, ploughs, threshing machines by various makers, including English ones. There was a steam-engine for raising water at work while I was in the building.

On the first floor, models of fishing boats, specimens of tackle, &c., filled one room. In the space at the top of the main staircase desk-cases were used back to back, and the flat ledges where they met furnished room for models of sheep. In the neighbourhood were specimens of various kinds of wool. Wagons and draught animals from every part of the world were illustrated by models. There were also specimens of horse-shoes of all kinds. The models, further, included German farm-houses (especially those of Luneburg), milk-cellars, cow-stalls, sawing- and corn-mills, barns, hop-gardens, &c. On the walls were photographs of cattle, charts showing the import and export of cheese all over Europe, also illustrating the bacteria found in milk and cheese. Other charts showed the nature of the soil and the modes of cultivation employed in various districts.

The "Zootechnical" collection contained specimens of plants in desk-cases with their technical applications. Thus, for instance, the uses of wheat-straw were illustrated by specimens. An interesting case contained on one side models of edible, on the other of poisonous, fungi. These were in papier-maché, as were also the models of pears, plums, apples, potatoes, carrots, &c. There were also the actual fruits dried in various ways. Flowers were represented by wax models. And all these specimens were accompanied by models showing the best ways of training the several fruit trees against walls.

Pisciculture and the cultivation or production of the following articles were specially illustrated by models: tobacco, tea, coffee, malt. All sorts of grain were represented, including some specimens from Troy. The chemical composition of, *e.g.*, lettuce, spinach, cauliflower, kidney-beans, was illustrated by the results of analysis in glass-stoppered bottles. Specimens of vegetable colouring matter were also in bottles.

An important feature was the colonial collection, including timber, fruit (in spirits), and useful plants. In addition to European species, the collection included timber from America, Africa, and Australia. The leaves, fruit, &c., of each tree, and sometimes objects made from the wood, were placed against each specimen. Many of the specimens were 1′ 6″ × 11″ × 1″.

Hygienic Museum, Berlin.—The Hygienic Museum is situated in the Klosterstrasse. It originated in an exhibition (held in 1883) of appliances for preservation of health and life. It consists of rooms arranged round a central open courtyard. The ground floor is devoted to models and plans of workmen's dwellings; systems of heating, ventilation, drainage, roadmaking; also methods of security against accidents from boilers, machines (especially agricultural), &c.; also against the dust or noxious gases which make some employments dangerous to life. The first floor illustrates approved appliances for hospitals, swimming-baths, schoolrooms, asylums, prisons.

The striking number of excellent models is aided by drawings on the walls. The rooms are numbered and the figures are painted on the jambs of the openings leading to them. Arrows show which room is being entered, which left by the visitor.

The specimens of boiler incrustation were rendered more impressive by a series of photographs representing a boiler explosion that had been caused by it.

Charlottenburg Technical High School: the collections.—The *Mineralogical* Museum occupies three rooms in the basement, and is under the supervision of the Professor of Mineralogy. The central cases contain the specimens as arranged for purely scientific purposes. The side cases show some of their practical applications. Thus cabinet No. 1 contained specimens of carbon, sulphur, antimony, arsenic, bismuth, molybdenum, wolfram, uranium, in their technical applications, for instance, in lead pencils, diamond glass-cutters, cinnabar, &c.

A peculiarity in the cases against the external walls has already been noticed *: the cases opposite the windows had the customary flat fronts. The wall-case containing ores from the Harz Mountains was only 6″ from back to front. Many of the objects were unprotected, as, for instance, the beautiful column of rock-salt which stood in the centre of the room.

The collection of *building stones* contains marbles, sandstones, limestones, slates, &c. On the walls were photographs of granite quarries at Bischofswerda and Kameng in Saxony; of sandstone quarries at Alt Warthau, and Wenig Rackwitz in Silesia; of houses and monuments showing the durability of these stones. A large map on the wall showed the geological formation of Central Europe. The flat tops of the desk-cases against the walls were used to display small square slabs of marble. Cupboards on the tops of the cases facing the windows contained, among other things, various kinds of clay in glass bottles.

The width of the room from window to opposite wall was about 27′. The central case was about 18′ long. The gas was supplied by two long pendants, each with two burners. These came within 6′ from the floor.

Objects placed in the adjoining corridor showed how the stones exhibited in the cases might be arranged in cornices, pilasters, panels, &c.

The *mechanical* collection is contained in the room to the right of the main entrance. As will appear from what follows, it contains specimens selected from the collections of a more special character.

It comprises models to a large scale of the following objects: Girder bridges with horizontal and with curved upper flanges, printing and lithographing presses, windmills, water wheels, American tanning mill, sawing mill, oil press, dynamometer, weighing machines, end of steam-engine showing external and internal construction, complete steam-engine, pile-driver, crane, cattle-weighing machine, leather-dressing machine, flax-spinning machine, steam pump, ship's screw, ploughs of various kinds, &c. The specimens are not under glass. They were somewhat dusty when I

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* See page 194 *ante*

saw them, but visitors are few, and the risk from damage in this direction is perhaps less than in an ordinary museum. Other specimens are kept in cases, *e.g.*, barometers, chronometers, and clockwork of various kinds, models of looms, ploughs, harrows, &c., to a small scale.

The collections for *mechanical technology* fill several rooms on the first floor. The first contains iron bars of various shapes, including rails, showing their appearance after undergoing various tests. Some flat cases on tables contain various specimens of wood. An interesting collection of African woods consists of book-shaped specimens. The smaller specimens are put close together like books in a case with the titles pasted on the back. The larger specimens stand singly. There is another large collection of Paraguayan timber. In a wall-case are specimens from Burkart's "Sammlung der "wichtigsten europäischen Nutzhölzer." These are in thin layers on cardboard. In addition, there are numerous varnished pieces of ordinary timber. The cases in the second room contain the following objects, among others: instruments of measurement, models of tools; and, as in the Mining Museum, special attention is given to showing the applications to which raw materials may be put. There, however, the scientific aspect was most prominent; here, the technical. An interesting case sent by Faber contained the raw materials used in making pencils: the Siberian and Bohemian graphite, the cedar wood, the wood grooved to receive the lead and the covering pieces, and, side by side, the finished pencils. Another case showed the various stages of enamelling on bronze. The third room contained a number of models exposed to view. They included carpet loom with Jacquard appliances, braid-making and cotton-printing machines, &c.; also an English flour-mill, pugmill, &c. There was an interesting model of a mechanical workshop, showing the Austrian process of stopping motors. The cases contained examples of organic products used in manufacture: samples of raw Indian, Siamese, and American cotton arranged according to their qualities; also of cotton after it has undergone successive stages of preparation. Similarly flax and hemp were shown in the stages employed in string manufacture, &c. The appearance of silk cocoons at various dates in their development was illustrated in the neighbourhood of the silk exhibits. Side by side with the manufactured woollen goods were the mixtures used to produce the different coloured wools. The fourth room was filled with magnificent models of manufacturing machinery. These were about a quarter the real size, and had been executed mainly in the workshops of the Royal Trade Institute. They were placed, for the most part without further protection, on a series of tables about 2′ 6″ high in the middle of the room. The models include specimens of the machines employed in cotton and woollen manufactures, among others carding and combing machines, fly frames, mules of all descriptions, throstle frames, &c.

The *museum of engineering construction* was on the second floor. The specimens were arranged as follows: On the end table were full-size casts of bases, and caps of iron columns; full-size models showing connection of main and subsidiary girders. There was also a model of iron roof with galvanised iron covering. The models in

several instances were by Louis Wolfsberg, of the Polytechnisches Arbeits-Institut; these were well executed. Another model showed the intersection of trusses springing from the centres of the sides, and the angles of a square compartment; another model illustrated a flat glazed ceiling with an iron roof above. In the central case, which was painted white inside, were models of railway points and of barricades at level crossings. In another case were specimens of asphalte materials, and of cement in bottles. A flat shelf 2′ wide, bracketed out from the wall 4′ above the ground, was used for trade catalogues, photographs, &c. The models in other parts of the room included a pile-driver, a pontoon bridge, scaffolding and caissons for pneumatic foundations, model of viaduct of Berlin town railway, showing the construction of permanent way, in which asphalte is used in two layers over the backs of the arches. Photographs of engineering works are exhibited in the adjoining corridor. These were chiefly taken during construction, in order to show the method of scaffolding. Cases against the walls contained specimens of paving stones, basalt lava, porphyry granite (the latter from Rhenish Prussia, and Oberstreit and Schneeberg in Saxony); of sand, lime, Portland cement, Pozzuolana, Silesian marbles, red sandstones from Nibra, Dittlingen, Maulbronn, Glatz, white sandstones from Seeberg, Cotta, Postelwitz, Rackwitz, limestone from Savonnière.

The *Geodetic collection* is in the basement. The foundation of the stand for levelling is carried down to the solid ground, for the sake of firmness. The cases contain a number of theodolites and levels. There is an instrument for testing barometers. A case at the end of the room contained models in plaster to a small scale of typical stretches of country. Another case contained standard specimens of lettering, shading, &c., for surveyors' maps. The tripods, &c., for use with the instruments were kept in an adjoining room. Steel bands 20 metres long are used instead of measuring chains. The levelling staffs are, of course, marked in decimetres and centimetres.

The *architectural collection* contains a fine series of models of buildings both new and old. In the drawers are original drawings by deceased and living German architects. Designs—some competitive, some never executed—are hung in frames on the walls. In close connection with them are the already mentioned models; also actual-size casts of certain portions of the façades, enabling the student to grasp the proportions of the actual buildings.

TECHNICAL HIGH SCHOOLS.

Charlottenburg.—This institution is housed in a fine new building on the western border of the Berlin Thiergarten. The main block is 600 feet long by 175 feet deep from front to back, with two large projecting wings. It has five interior courts, of which the one against the main entrance is covered in. The basement of the exterior is faced with red sandstone; the upper storeys are in yellow sandstone with white sandstone dressings. The principal staircases are of red granite, unpolished,

with the exception of narrow strips at the side. The interior courts are faced with yellow bricks, with brick bands of a darker yellow. The dressings of the lowest storey, including the bases of the arcade of first storey, are of red sandstone. The other dressings are in white sandstone. The spandrils are filled in with sgraffito ornament. In the grounds are a chemical laboratory, technical testing institution, and an engine-house.*

The Technical School is a high school; it is not intended to serve as a continuation school. The instruction is given in five departments: architecture, civil engineering, mechanical engineering, chemistry and metallurgy, pure science. With the exception of the electrical appliances, the fittings for these departments fell outside my purpose. The collections, on the other hand, were very suggestive from a technical point of view, and have been described more or less fully.

The electrotechnic laboratory was about 38′ 6″ × 35′, and was on the ground floor. Being situate at a corner of the building it was lighted on two sides. Benches for working were bracketed out against some of the windows. Small shelves at the same level were placed against the piers between the windows. In the centre of the room was a stand for chemicals. There was also a table 2′ 8″ wide × 10′ long × 2′ 7″ high, covered with lead with raised rim. A side case contained telegraph apparatus. The floor adjoining the table for chemicals was of cement concrete. A desk-case contained different kinds of electric burners.

The building for technical experiments lies in the grounds to the south-east, and is two storeys high. It is devoted to tests of all sorts, and is *not* a school of engineering. Students are admitted to the operations carried on only so far as this can be done without impeding the proper work of the institution. On the ground floor, to the right of entrance, is the iron testing room, about 80′ × 25′. This is carried up two storeys. The roof is constructed with iron trusses, and is covered with wood-boarding on the backs of the rafters. The floor is of asphalte on wood-blocks. The foundations of the heavier machines are of brick two mètres deep. The machines are of German manufacture, and include testing apparatus for compression, transverse strain, &c. The specimens tested are preserved in a separate room.

The oil-testing apparatus has reference to viscosity and flame-point. The paper-testing apparatus is unusually complete; one of the chief tests is that of tensile strength. Crushing in the hand is a simple and adequate test in many respects. Cotton, linen, and other textiles are tested in much the same way as paper.

Dresden Polytechnicum.—This building overlooks Bismarck Platz. It was erected, 1874–75, from designs by Heyn, and covers an area of 4,200 square mètres. A complete account of it, with plans and photographs, is given in the *Festschrift*, published when it was opened.

The system of ventilation is carried out on the warm-air system, but "so far

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* Some interesting particulars are given with respect to the main block in *Bauführung und Baurecht* p. 184. It was building for six years and a half, 1877–1884, and cost 267,000*l.*—F. G.

" deviates from the usual method that a special heating chamber and system of air-flues " is provided for each room that requires to be ventilated or heated. So long as the " rooms only require to be heated and not to be ventilated, the cooled air returns down " to the heating chamber by suitable flues, in order that it may be warmed again. The " necessary ventilation is provided by mechanical means, fresh air from outside being " forced in by a ventilator driven by steam-power. It travels along the main horizon-" tal flues into the several heating chambers. Here it is warmed, and thence taken " up into the rooms by warm air-flues, while the foul air escapes up into the roof. " The air for the 'aula' is not warmed by stoves like the remainder, but by steam " pipes, and is conducted into the room at the ceiling level in fine jets." *

I visited the technological, engineering, architectural, telegraphic, and electro-technic collections. These were all arranged with a view to their use in instruction. Thus, the engineering contained wood and iron models to a large scale of details in iron construction; the architectural collection contained models of roofs, &c., casts of architectural ornament; the technological contained details of machinery—some models, others actual specimens—also tools of all descriptions; the telegraphic collection contained semaphores, keyboards, &c., to various scales.

The electro-technological laboratory was provided with steam-power. The stands against the windows resembled the arrangement at Charlottenburg; there was in addition, however, a smaller shelf underneath on which chemicals might be placed.

Many of the doors were provided with glazed slits, on the inside of which thermometers were placed so that the attendant could see them from the corridors and regulate the temperature of the rooms without disturbing the classes. This arrangement requires care lest the contact with the air in the corridor should interfere with correct indications.†

Royal Technical Institute, Chemnitz.—The mechanical collection comprises details of machinery; of these full-size drawings are made by the students. The technological collection contains the tools required in the various trades. The shelves in the cases are alternately broad and narrow. One case contains instruments devoted to minute measurements of length, weight, and temperature. The keys of the various cases are hung on hooks in a small cupboard fixed to the wall. A single key is thus sufficient for all the cases in a room. The spinning collection contains models of looms of various makes and dates. There is a power-loom worked from motor in basement. In the "Foremen's" collection were models of malt machinery, samples of millstone materials, artificial and natural; also samples of grains, with the flour and by-products obtained from them. A case of samples showed the application of worsted to the manufacture of cloth. This was from a recent exhibition. The collection of building materials included wood models of roofs—some of them prepared by students—large-size models

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* Pp. 29, 30, *Festschrift.*

† Full particulars, with plans and photographs, are given in the *Programm* for Easter 1878. See also Felkin, p. 29.—F. G.

of details of iron construction, tiles, bricks, building-stones, &c.; large casts of architectural detail.

Nearly every class-room was provided with basin and tap. Cupboards, fitted top and bottom with $1\frac{3}{8}'' \times \frac{1}{2}''$ fillets, were placed in some of the corridors to hold the drawing-boards. These, in order to fit, were required to be of specified sizes. Adjoining these were chests of drawers, one drawer for each student. The free-hand drawing room was divided into sections by wooden partitions formed of $1'' \times 7''$ boards fixed vertically; the sole-plate was $2\frac{3}{4}'' \times 3\frac{1}{2}''$; the partitions were 9′ 9″ apart. By means of these light from the back was avoided. The electric lights were fixed in front of the student. Many of the class-rooms were provided with counterbalancing blackboards. Sometimes these were hung side by side, being connected in the centre by a cord passing over a pulley, the outer sides being hung with weights in boxes at the ends; sometimes the boards were hung one behind the other.

The testing department for building materials consists of two rooms in the basement. The first is for compressive and tensile tests of stone and cement. The cement specimens are cast in the familiar shape ⊂⊃. The compression is measured by atmospheres. On the wall is a small cupboard containing specimens which have undergone tests. The second room is for testing iron and metals generally. It is fitted with a machine for tensile experiments made by the Werkzeug-Maschinen-Fabrik, Chemnitz. The gas-engine is in the same room. As in the first room, the specimens showing the results of tests are preserved for reference.

Hanover Technical High School.—The building now occupied by this institution was formerly the royal palace.

The technological collection included nails and screws of various kinds, pottery with the materials employed in manufacture, including fragments of porcelain showing fractured surface (these were in glass bottles), tiles showing materials and stages of production, rails, axles, &c., showing section, lead and copper specimens. There were, further, samples of raw cotton, flax, and hemp side by side with the manufactured products, also details of machines employed in flax and cotton spinning, tools of all descriptions, specimens of timber and of various joints employed in woodwork.

The mechanical collection is so arranged as to show the historical development of machinery, beginning with machines for measuring space and time, utilising water, &c. There are very complete series of models of windmills, watermills (vertical and horizontal turbines), ship construction, agricultural machines. Rolls of drawings of the several kinds of machines are kept in tall narrow cupboards. This is not so good as an arrangement adopted in another room [fig. 98].

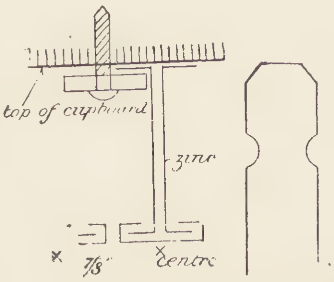

Fig. 98.—Arrangement for holding Charts and Drawings.

Zinc U pieces are fixed to the top of the cupboard back to back by means of small square iron plates screwed to the wood top. The bottom of the U pieces is secured by

another piece of zinc bent round. The distance apart from centre to centre is $\frac{7}{8}''$, $\frac{1}{8}''$ being left for the charts to hang between. The shape of the end helps the drawing to be drawn out. A curtain is hung in front to keep off the dust. There is a small workshop in connection with this establishment, in which the needful repairs are done.

The kinematic collection contains a very complete set of models to illustrate modes of motion. Some of them were by Rigg of Chester.

The majority of the rooms belonging to the electrical department are in the basement. The lecture-room (on the ground floor) is small—too small for the requirements. The gas motor by Dentz is at one end. It is fixed on a brick platform 6′ 0″ × 3′ 9″ and 2′ 3″ above the floor level. The fly-wheel is 6′ 8″ in diameter. The shafting runs for a short distance opposite the engine in front of the recess and the whole length of the room against the windows.

The dynamos rest on a platform constructed as follows: there are four piers of brickwork 6′ 0″ × 1′ 6″ rising about 9″ above the floor level. On these are laid 7″ iron joists with 9″ × 3″ pitchpine planks laid flat on the top. Of these there are three rows running side by side. Joists 6″ × $7\frac{1}{2}''$ are slipped under the longitudinal pieces to strengthen where required. The cross-pieces carrying the dynamos are notched on the longitudinal pieces. The dynamo stages are stiffened by 6″ × 6″ horizontal stays bolted to the longitudinal pieces. One stage was adjoined by a "work" measuring machine fixed on an upright stand.

The electrotechnic laboratory opens into the dynamo-room. A lead-lined trough is provided 2′ 0″ × 4′ 0″ and 2′ 9″ from ground to upper edge, with tap grating and waste. The blackboard has decimetre squares marked upon it. The subsidiary rooms include workshops, professor's room, private laboratory, room for electrical measurements.

The ventilation and heating of the building are managed as follows. A channel high enough to stand up in runs under the basement corridor. Air is forced into this by two "paddle-wheels,"* being purified of dust by passing through a sieve. The air flues communicate with this main flue. The heating is effected by steam pipes. There are five boilers in the basement fitted with movable grids † by which coal is supplied gradually, as it is burnt so as to avoid smoke. Heating spirals are placed in the various apartments, with pipes $1\frac{3}{8}''$ external diameter. From these the steam is returned as it condenses to the boilers. The motor for the "paddle-wheels" was by Egerdorf.

OTHER TECHNICAL SCHOOLS.

Trade Schools, Hamburg.—The first and second storeys above the museum are devoted to the trade school and the "real" school. A few rooms are used in common by these two departments. Of the rooms specially devoted to the trade school, the

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* Schaufelräder.—F. G.

† Bewegliche Rosten.—F. G.

first floor contains the office-director's room, common room, drawing and modelling rooms, store rooms, library and reading room. The second floor contains drawing, painting, modelling and other class rooms, physical lecture room, with store room for apparatus.

The "Aula," or Hall, is 60′ 0″ long, 34′ 6″ wide, and 32′ 6″ high. Some drawing and modelling rooms are about 39′ 0″ × 23′ 0″; others 36′ 0″ × 21′ 6″. The ordinary class-rooms range about 24′ 0″ × 20′ 6″. The height of each storey in the clear is about 15′ 0″. The corridors are 10′ 9″ wide. The building is provided with heating by warm air, and mechanical ventilation. The foul air is carried up into the roof. The ventilation in each class room is managed by inlet and outlet flues placed in opposite walls, and valves fixed at a convenient height to enable the occupants of the room to regulate the amount of hot and cold air admitted. I was informed that the inlets sometimes admitted smoke (probably from adjoining flues). The class rooms become very hot at night when in use, and at no distant date gas is to be replaced by electricity. The gas-pipes are, of course, fixed on the surface of the walls and ceilings.

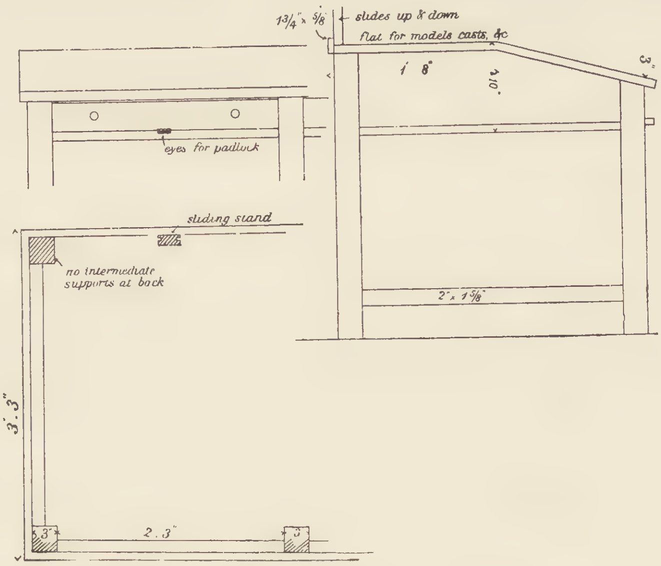


FIG. 99.—HAMBURG TRADE SCHOOL: DRAWING-TABLE WITH MOVABLE STAND.

The fittings of the drawing-class room are unusually complete. The casts are hung in part on wood fillets $2\frac{1}{4}'' \times \frac{3}{4}''$ fixed diagonally to the walls, trellis fashion, for a height of about four feet above the top of the wood dado. But this arrangement gives rise to confusing shadows; the casts would be much better against the wall. The cases containing the clay for modelling are lined with zinc.

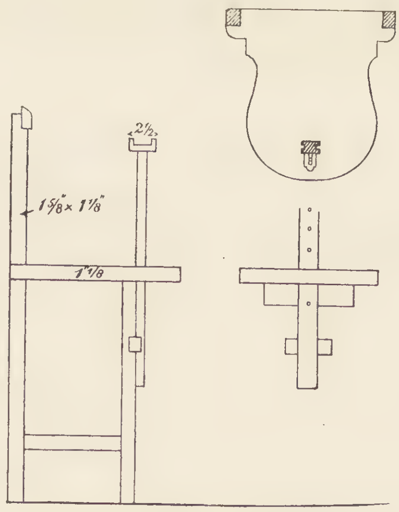


FIG. 100.—HAMBURG TRADE SCHOOL: CHAIR FOR DRAWING-BOARD.

Hamburg Trade School for Girls.—The Trade School for Girls is situated in the

suburb of St. George. The building is four storeys high. The basement contains warm air heating apparatus, two rooms for washing and ironing, kitchen, dining room, and porter's living rooms. The ground floor contains the office, a room for interviews, two class rooms for teachers in kindergartens, kindergarten, gymnasium, and two class rooms of the trade school. In the first storey are the committee room, director's room, rooms for cutting out and machine sewing, and six class rooms; in the second storey, rooms for modelling and lithography, a drawing room, two other class rooms, and the director's apartments; in the third storey, bed and sitting rooms for teachers and resident pupils.

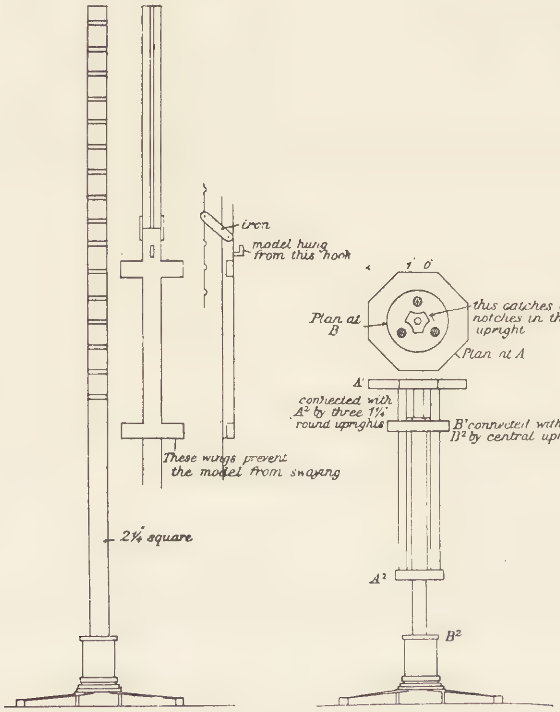
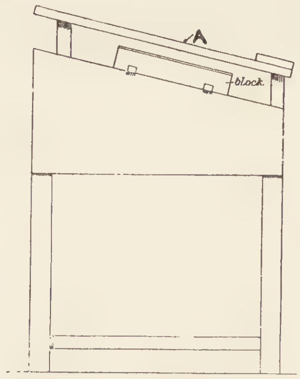


FIG. 101.—HAMBURG TRADE SCHOOL: STANDS FOR CASTS.



A. Open frame.
FIG. 102.—HAMBURG TRADE SCHOOL: LITHOGRAPHER'S DESK.

Agricultural School, Chemnitz.—This occupied two storeys of an ordinary dwelling-house. The fittings were of the simplest description. There was a small technical library. The collection of aids to instruction occupied three small rooms. One of these included an upright case with stepped stages containing samples of seeds in bottles, artificial manures and their several constituents also in bottles. On the lower portion were papier-maché models of fruits, potatoes, &c. Another case, divided into three by vertical divisions, contained preserved birds, snakes, and various wild animals, and plants likely to be met with by the German farmer. Other cases contained physical and astronomical apparatus, models of ploughs and other implements, models of horses, cattle, sheep, &c. An adjoining room contained skeletons of the cow and horse, also anatomical models of the human subject as well as of veterinary subjects.

In another small room was a mineralogical collection of a special character, and the wall was covered with geological maps of Saxony.

The Higher Weaving School, Chemnitz.—The Higher Weaving School occupies a three-storeyed building. The engine is placed in the basement. The ground floor to the right of entrance is devoted to power-looms. On the other side of the staircase and vestibule is an instructor's residence. On the first floor, the front of the building is devoted to Jacquard looms, on the second floor to ordinary hand-looms. There is a class room on the second floor, and a teacher's common room or class room on the first floor, where also cloak and lavatory accommodation is given. The building is supplied with some forty hand-looms in addition to the machine-looms. These are of American, German, English manufacture. New ones are added from time to time. Each loom is fitted up with a pattern already in making. The hand-looms severally occupy spaces about 4′ 8″ wide and 4′ 8″ to 7′ 0″ long. The rooms are 13′ 0″ high. They are kept very clean, it being an instruction that house-shoes are to be worn in the weaving shops. Part of the wood apparatus, *e.g.* for winding, was made at Basle; the wood-looms generally in Chemnitz.

The Evening School for Weavers.—The weavers of Chemnitz have a club of their own, and in connection with it a weaving school. This does for the workmen what the higher school does for the masters' sons and the foremen. The school building is three storeys high. The mechanical looms are on the ground floor, four on one side, two on the other side of the entrance. The hand-looms are on the first floor, the second floor being devoted to a class room and a room for freehand drawing. A cupboard was provided in the class room for the aids to instruction: cotton in its raw state, silk cocoons, glass and asbestos for spinning, &c.

Evening Technical Continuation Schools.—This introduces the last class of technical school, the continuation schools for workmen. In these, drawing, book-keeping, modern languages, physics, and chemistry are taught as required by each locality, and always in intimate connection with the several trades. The instruction for workmen employed in the building trades was very complete in character, and deserves more detailed description than would be in place here. In several towns, for example, at Hamburg and Leipzig, builders' tradesmen have special schools to themselves.*

The building already described as occupied by the Hamburg Trade Museum and School is attended by some two thousand evening students at the classes just mentioned, and more general classes.

The continuation schools of Berlin avail themselves of the public elementary school buildings. A uniform arrangement is seen everywhere. The buildings are usually several storeys high, and the various rooms open off one or both sides of broad corridors. There is no central hall system like that which is sometimes used in England. Like other new buildings in Berlin, the new elementary schools are faced with the fine local yellow or red bricks. The simplicity of the arrangement, and the

* Schulen für Bauhandwerker.—F. G.

fact that the buildings are primarily intended for children, lessened their interest from my special point of view. The desks used in the daytime are naturally inconveniently small for the evening students. The few special fittings chiefly consist of stands for modelling, and drawing desks. Another important part of the equipment consists in the models used in instruction. Thus in the school behind the garrison church there were plaster models for the drawing classes in great abundance, locks, &c., for the locksmiths, wood models of machinery construction, &c. These wood models had been executed by a local joiner to the order of the school authorities: the more delicate parts were executed in iron. They were very expensive; one set representing an apparently small detail of machine construction cost 7*l.* 10*s.* The most important continuation school in Berlin was that in the Reichenberger Strasse. It is located in an elementary school of the usual type, and was attended in the year 1888–89 by no fewer than 2,338 students. This number, of course, includes both the students at the general, as well as at the technical, continuation classes. The whole number for Berlin was 13,549, or about one per cent. of the population.

In Saxony, attendance at a general or technical continuation school is compulsory on all youths till the age of seventeen, unless receiving education elsewhere; and the proportion of students becomes correspondingly greater. At Dresden I visited the "Sunday School," the school of the Handworkers' Union, and a school conducted by private enterprise. The "Sunday" school is so called because instruction is given on Sunday mornings before and after morning service. In addition, it is given from seven to nine o'clock on two evenings in the week. The building belongs to one of the public elementary schools. A few classes are held in a new wing of the school approached through the door at the extremity of the wing. The school of the Handworkers' Union is held in a similar building. The master's chair and table in each room are put on a slightly raised platform, and behind them the wood dado is raised to form a sounding board. The gas-burners are numerous and brought quite low: each is provided with a reflector and a shade. The gas-pipes, as usual, are on the surface of the ceiling. This school is well provided with models, including sculpture and architectural detail, wrought-iron work. These are kept in cases in the corridors. The "Trade School "of the Trade Union"* is at present a private enterprise, and is located in a house which belongs to the director. The fittings are of a simple character, and do not call for special notice. The school possesses good collections (1) of plaster casts, (2) of wood models of geometrical solids, (3) of

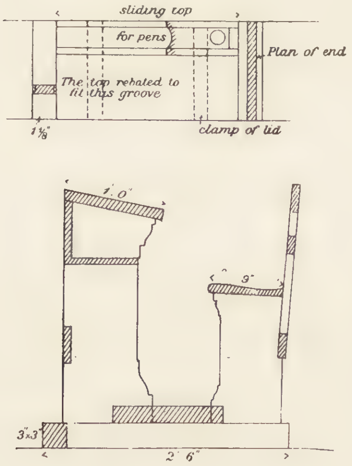


FIG. 103.—SCHOOL OF THE HANDWORKERS' UNION, DRESDEN: DESK.

* Gewerbeschule des Gewerbevereines.—F. G.

joinery details, (4) of models of machinery details. A special room is provided for the plaster casts.

Chemnitz is well equipped with evening schools. The continuation school of the "Handworkers'" Union was attended at the end of last year by 1,605 students. It is situated in the building of a public elementary school for girls, and the fittings for the evening classes consist of those which have been in use during the day. Another school which I had marked out for a visit was closed for the vacation, and I was unable to go over it. Technical instruction is also given in the evening at the Royal Technical Institute.

Leipzig is well equipped with continuation schools of every description. Unfortunately my visit coincided with the vacations, and I was unable to obtain admittance to several schools. The trade school, the school attached to the Academy of Art, and the building school, were on the point of being removed to new quarters. The trade school's old home was said to be suitable except in respect of size. The planning of the other schools, as far as could be judged from illustrations in a work on such schools,* presented nothing out of the common. I, therefore, gave the greater part of my time to inspecting the new buildings, especially the new Academy School and Building School.

At Hanover, again, the Trade School, Kobelingenstrasse, was closed. The Trade School of the Workmen's Union, however, was open. This institution was of an exceedingly interesting character. It is supported by the voluntary contributions of its members, the workmen of Hanover. It purchased its headquarters five or six years back at a cost of 5,400*l.*, and altered them at a cost of 1,800*l.* Some of the rooms overlook the street; the chief ones are on the first floor, and are grouped round an internal court; they include a large hall, ball-room, cash-room, news-room, committee-room, class-rooms, including rooms for modelling. The library and one or two class-rooms are on the second floor. The whole of the building, except the committee-room, was being used for instruction when I paid my visit.

MISCELLANEA.

New streets and buildings in Berlin.—The footways are sometimes paved with asphalte, very often with flagstones in the centre, the sides being filled in with a boulder pavement, or sometimes not paved at all. The roadways are paved with squared stones (rather larger than the ordinary granite setts), laid diagonally. Asphalte is being used also for the roadways in the chief streets. The Panopticum Arcade, which adjoins the Unter-den-Linden, is paved with tiles set diagonally. Their surface is broken by shallow grooves. The danger of slipping and the noise made by passers-by is materially lessened by this arrangement.

The electric light is used in Berlin to a very great extent. Most of the large shops, the hotels, and places of amusement are provided with it. It is beginning to be

* Göck, *Gewerbliche Fortbildungschulen.*—F. G.

used in the principal thoroughfares; during my stay in Berlin the gas lamps along the Unter-den-Linden were being removed to make way for electric lights.

The Thiergarten is chiefly lit by oil lamps supported on posts of the usual shape. The trees are planted very close together and without much regularity, except along one or two main avenues. The paths are simply sand.

The "Siegesdenkmal" (Monument of Victory) in the Thiergarten has round its base an historical mosaic, from designs by Von Werner. The same artist designed the polychromatic decoration in tiles and mosaic of Herr Pringsheim's house in the Wilhelmstrasse, and the wall-paintings in the Café Bauer. These, and the frescoes by Cornelius along the front of the Old Museum, give some marvellous effects when the sun is shining. The eye rests on them with the greater interest that it is not distracted by gaudy advertisements. These are confined to the circular structures, like huge pillar-boxes, which stand at the street corners, and serve to display the playbills of the theatres. To return to the Siegesdenkmal: the steps to the summit were of granite in the lower portion, then of white marble, while the top portion was of sandstone. The marble steps show signs of wear; the granite and sandstone steps not at all. The paving round the base is of a kind often met with in Germany. It is a species of granite macadam in three colours, light grey, red, and indigo. These are disposed, mosaic fashion, in bold geometrical patterns.

The scaffolding of the new buildings was usually constructed of squared timber, and carried up to the top soon after operations are commenced. Precautions for the safety of the workmen in this particular are rigorously demanded. The provision under this head, which occurs in the form of contract issued by the Ministry of Public Works, runs thus: "The contractor bears the sole responsibility for the soundness and "strength of the scaffoldings. On the order of the superintending architect he is "bound to complete or to strengthen the same immediately and at his own expense."

Some examples of building materials were exhibited in the corridors of the Charlottenburg Technical High School. The clay for bricks and terra cotta was uniform in texture and colour throughout, and the terra cotta samples were very clean and sharp. Some tiles were shown let into blocks of sandstone in geometrical patterns. They were highly glazed, and sky blue or Prussian blue in colour.

Limestone is very little used in Germany: a great part is said to come from Savonnière. The sandstone is red, yellow, and white in colour, and comes from the valley of the Elbe.

The excellent quality of the bricks, the sharpness of their edges, and the dry climate, taken together, allow the recessing of the mortar joints, which gives such effect to the Berlin brickwork. Another peculiarity is the use of half and quarter bricks in the facing. This is due to the by-laws, which make no allowance for the facing in the thicknesses required for exterior walls.

The brick used for the interior walling of the new shops and residential blocks in course of erection is ordinarily the local yellow. Some of the fronts are beginning to be faced with brick; the majority, however, are still faced with stucco in the old

fashion, the brickwork being carefully adjusted to the stucco detail. The new railway stations—as, for example, the Friedrichstrasse and Anhalt stations—are faced in brick. The new House of Depúties, overlooking the Thiergarten, is being faced with white sandstone. The brickwork was already nearly finished, the sandstone facing being applied afterwards. The following paragraph, taken from an official form of specification, explains the process usually carried out * :—" The work is to be toothed as required " for the general walling, the doors, windows, arches, &c., so that the facing and " moulded bricks may be inserted later on in a proper way. The facing materials " must not be thrown down upon the scaffolding, but carefully laid down by hand in " order to avoid injury. The contractor is alone responsible for the use of materials " defective in form or colour. Should such materials be employed, they must be cut " out and replaced in accordance with the specification. The heights of the courses, " including the joints, must be accurately set out beforehand, and the facing carefully " executed in accordance with them. It must also be protected against damage and " disfigurement, and especially against the dirty water running from the scaffolding " during heavy rains. It is strictly forbidden to use iron or stone to scrape lime, &c., " from the surface. All dirt is to be swept at once from the faced surfaces with a " damp brush of straw. Acid is only to be used in cases of necessity. All joints must " be scraped out at least $1\frac{1}{2}$ centimetre (about half an inch) during the progress of the " building. This must be done with great care. The mortar must never project beyond " the face of the wall."

Ethnological Museum, Berlin.—This institution is at the corner of the Königgrätzerstrasse, and has the Industrial Art Museum for its neighbour. It consists of three storeys, grouped round a central courtyard. The entrance hall goes up through two storeys. On the ground floor are the Schliemann and prehistoric collections. The American, African, Australasian, and Pacific collections are on the first floor, while the second is occupied by the Indian and Chinese collections.

The floors are laid with tiles, the surface of which is rough and covered with cracks like crocodile-leather. These lessen the noise, as also do the linoleum strips on the treads of the granite stairs. The construction is fireproof, the floors being filled in above the fluted centering of galvanised iron, which goes from each iron joist to the next. The centering is not painted, and has a good effect. The columns in the entrance court are of white granite, the lower portion only being polished, and with gilt bands round the middle and gilt capitals. The columns in the other portions are of iron. The windows facing the street are double ; the open court is faced with white bricks.

New buildings, Leipzig.—The new Academy of Art, the University Library, and the Imperial Law Courts of Germany, are being erected on adjoining plots of land.

The *heating and ventilation* of the new Academy are managed as follows :—Fresh air is introduced from the open space behind the building by openings in the basement

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* *Bauführung und Baurecht*, p. 121.—F. G.

It passes through a long chamber (so that the dust may fall on the way), until it reaches the pulsometer. If the weather is cold, the air is forced through a heating chamber, where it is just warmed. The necessary moisture is returned to it by evaporating pans placed on the steam-pipes. The pipes are ribbed, $3\frac{3}{4}''$ internal diameter, $8\frac{1}{2}''$ to the exterior of the ribs. If the air does not require warming, it is passed under the heating chamber. The fresh air, warmed or not as the case may be, reaches a channel one mètre high, which runs above the basement corridor for its whole length. From this channel the fresh air is conducted by flues in the walls to the various apartments. Flues from the rooms carry the foul air to the roof, and thence the air escapes by ventilating shafts.

It was an instruction to the ventilating engineers who tendered, that the heating and ventilating systems were to be kept independent. The heating is managed by three boilers (which also supply the steam for the ventilating chamber). From these steam is conducted to the heating chambers, where it heats hot-water circulating pipes communicating with the various sets of pipes throughout the building. The condensed steam is returned from the chambers already mentioned to the boilers. The boiler flues go into one chimney. The several rooms are heated by systems of upright pipes communicating with hollow chambers at the top and bottom, and regulated by valve where they are supplied from the circulating system.

The entrance court, being immediately over the boilers, was not considered to require special heating. The "aula" immediately behind it is arranged with a view to two conditions. It is only used at intervals, and, secondly, on these occasions it must be speedily heated. A special heating chamber is therefore provided, on the same model as the principal one. While the room is being heated, the air from the aula is passed through the chamber again and again on a circulating system; immediately the audience begins to arrive, the circulation is stopped, and the air to be warmed is taken from without. The tender for the installation, exclusive of brickwork, masonry, perforations, making good, &c., was about 4,300*l*.

The basement overlooking the space at the back has the outer walls constructed with polygonal porphyry blocks from a quarry at Rochlitz. This stone is very hard and difficult to work. It is also used for some of the basement internal walls. The sandstone facings and dressings are from Pirna; but the sandstone being very soft, all the cornices and strings have to be protected with zinc. The red-brick facing is half and quarter brick. As already remarked, the by-laws take no account of the "Verblendung" or facing. The lime used is grey and slightly hydraulic. Artificial stone and marble are much used. The artificial stone is used for cornices, balustrades, &c.; it rings like terra-cotta. Some of the balusters, by the way, were not truly turned. The artificial marble (Stückmarmor) is of "alabaster-gyps." Plain surfaces cost about 1*l*. 10*s*. a square metre, rounded surfaces, as of columns, 2*l*. 10*s*. to 3*l*. 10*s*. It is liked because colours and sizes can be prescribed, but "with real marble," said Mr. Architect Mebius, "you take what you can get."

The filling-in under the floors is composed of a kind of clay which is free from

organic intermixture, and enters into chemical combination with water. The floor of the basement corridor is asphalte. Some of the rooms have the floor laid upon $4\frac{3}{4}'' \times 4''$ joists bedded in the filling-in. These are treated with carbolineum as a protection against dry rot. The floor of the "aula" is to be of triangular tiles. The plastering is executed as follows: first, battens, second a combination of wire with straw,* the third and fourth coats in rough plaster, the fifth and last a white finishing coat; this last is left slightly rough and then rubbed down. If rough it is considered better for painting. Ordinarily the walls are washed with soap and water, and then limewashed.

The gas-pipes are taken up along with the hot-water pipes; it being an advantage if the gas is warmed before being burnt (cp. the Siemens burner).

The drain-pipes are kept inside to avoid danger of freezing. Chimney flues are also built against internal walls. The stoves used in rooms are sometimes of iron. A stove in the director's new apartments stood just clear of the wall. It was $2' 6'' \times 1' 8''$ on plan, and faced with glazed tiles $8\frac{1}{2}''$ square. The flue from the fire-grate (which is, of course, built in at the bottom) is twisted about on its ascent in order that as much heat as possible may communicate itself to the stove. Roof-tiles are used to a great extent in forming the interior portion. Such a stove will remain warm for hours after a fire has been extinguished.

The roof is entirely of wood. The trusses, which occur at about 12′ distances, merely couple the roof together; they do not carry the rafters. The rafters are all $7'' \times 5\frac{1}{2}''$, and about 2′ 6″ apart. They are covered with $1\frac{1}{2}'' \times 9''$ boards. The roof is less sloping on the front than on the back. The wood beams used in the floors run parallel to the external wall, and rest on iron girders placed transversely. The lightning conductors are secured to the roof by means of iron tiles, or slates which match and bond with the rest. The slates are secured by hooks at the bottom. No leverage is allowed to the wind, and even in the Erzgebirge in exposed situations such roofs have stood for thirty years without suffering much damage. The windows are constructed with iron casements, and in order to make them watertight strips of linoleum are secured to the casements and the frames where they meet. The stairs are constructed with half-brick rings turned from iron joists (which act as outer strings) to wall. This construction is enclosed with wood and plaster of the usual form. In most German towns stone or some fireproof material is prescribed for staircases, *e.g.* Berlin, Chemnitz, Dresden; but in Leipzig wood is still permitted.

The new University Library adjoins the site of the preceding building, and is costing 125,000*l*. The construction is fireproof, no wood being used except incidentally, as in laths for roofing, &c. The iron joists of floors are 5″ deep, placed at 1′ 8″ centres, with a rise of $3\frac{1}{4}''$ in the concrete filling-in. A cement pavement, $\frac{3}{8}''$ (one centimetre) thick, is laid upon this. The roof is trussed with iron, and has iron rafters 2′ 6″ apart, across which the wood laths are laid. The stock brick for interior work is red, the

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* Vitruvius, VII. c. 3.—F. G.

front of the building is faced with white sandstone, the back with yellow brick. Limestone from Savonnière is being used for the sculpture, the figures were being modelled by Rassau of Dresden. In the entrance court white Carrara marble is being used for columns, &c.; a single shaft cost 22*l.* 10*s.*

In the case of the University Library, designed by Herr Rossmann, architect, and of the Academy of Art, designed by Herr Nauck, architect, the buildings were not being executed under the superintendence of their designers, but the Library under another architect, the Academy under the Municipal Building-Inspector. In Germany architects are often master-builders and carry out the designs of other architects. This is so with Herr Rossmann. Similarly I saw in Hanover an architect's door-plate on which it was announced that the same individual was prepared to undertake contracts.

FRANK GRANGER.

LXXIII.

THE ARAB HOUSE OF EGYPT. By Count R. d'Hulst.

Mr. Alfred Waterhouse, R.A., *President,* in the Chair.

Mr. President and Gentlemen,—

IT is a general custom in the Orient for a powerful monarch to build himself a capital city on his accession to the throne. Usually he chooses some distant part of the existing capital for the erection of his new palace, and transfers the seat of government to it. Sometimes the new creation survives; more often, however, it remains half-completed, and perishes after a generation or so, because his successor has built a new capital for himself. Thus, in the course of centuries, the capital moves to and fro, and officially even changes its name. Nearly every large city in the East offers in its history an example, and Cairo is rather conspicuous amongst them. Again, among Mohammedan countries, Egypt has been most often conquered and exposed to the dissensions of the military element, quarrelling for supreme power. These causes, as well as time, and an unreasonable imitation of European architecture, have furthered the destruction of Arab houses; there are still, however, some beautiful old ones left in Cairo, and the remains of their ancient splendour prove that the richness and elegance which the Arabs displayed in their public buildings were likewise attributes of their private houses.*

Arab writers tell us that the private houses in Damascus were built after the fashion of the late Roman houses, whereas in Persia, and especially in Baghdad, the ancient Persian house served as an example; in Northern Africa † and Spain ‡ the Moors

* Consult Lane, in *An Account of the Manners and Customs of the Modern Egyptians*, ed. 1860, pp. 6–24, which was written in 1833–35; also Mr. Stanley Lane-Poole, in the *Art of the Saracens in Egypt*, 1886, pp. 78–90. See also Mr. J. D. Crace's Paper on "The Ornamental Features of Arabic Architecture in Egypt and "Syria," in Transactions, 1869–70, pp. 75–85. In this Paper Mr. Crace gave sketches of details of construction both in stone and wood.

† Consult Mr. Alex. Graham's Paper on "The Roman Occupation of North Africa, with special reference "to Algeria," in Transactions, Vol. I. N.S. pp. 125–154, and his Paper on the same subject, "with special "reference to Tunisia," in Transactions, Vol. II. N.S. pp. 153–184.

‡ Consult Mr. R. H. Carpenter's Paper on "The Mosque-Cathedrals of Cordova and Seville, and some "Contemporary Arabic Buildings," in Transactions, 1882–83, pp. 101–115.

had evidently built upon the outline of the ancient Roman house. What connection, if any, exists between the Arab house of Cairo and those of the Coptic period is not known; resemblance with the town house of ancient Egypt, as far as we can trace it, there is none. The principles of the plan of the Arab house in various parts of Egypt may be defined thus:—

1. Grouping of the rooms around courts and gardens.
2. Absolute separation of the rooms for each sex.
3. Prevention of passengers in the street from seeing into the court.
4. Non-existence of windows towards the street, or arrangement of them to such a height that a man on camel-back cannot look into the interior; also no windows situated so as to overlook the apartments of another house.
5. Screening of the windows and bays of the upper floors in such a manner that the women can view life in the streets, and ceremonies and festivities in the courts, without being observed.
6. Arrangement of the entrance to the hareem in a special court, or, if only one court exists, in the part most remote from the entrance to the house.
7. Arrangement of rooms, kitchen, bath, stables, &c., under influence of the prevailing breezes, and construction of ventilators (malkaf) to air the rooms.

The Cairo house has generally several floors; the walls to the height of the first floor are built either of quarried stone, or cased externally, and often internally, with the soft calcareous stone of the Mokattam. It is not unfrequent to have, towards the street, a row of small shops on the ground-floor of the house, but totally unconnected with it. The superstructure, the front of which generally projects about two feet and is supported by stone corbels, is made of plastered brick.* The bricks are burnt, and of a dull red colour. The mortar is commonly composed of equal parts of ashes, Nile sand, and lime. The ashes are gathered from the baths and bakehouses; those from the baths, which latter are heated with street-refuse, give the mortar which hardens quickest. This mortar becomes reduced to dust in time. In the upper part of the house protrude bay-like constructions, projecting a foot and a half or more, mostly composed of turned wooden lattice-work, the so-called meshrebeeyeh; these were originally small projecting niches (like miniature bow-windows), destined to hold the porous earthen bottles, which were thus exposed to the air to keep the water fresh by evaporation. Afterwards enlarged, these meshrebeeyehs offered the double advantage of admitting fresh air and permitting the observation of life in the street without being noticed. They produce an attractive sight with their very prettily-turned lattice-work. In most cases the meshrebeeyeh is surmounted by kamareeyehs—viz., windows made of pieces of coloured glass, which are sunk into an arabesque of gypsum, and surrounded by a wooden frame; its roof is flat and surrounded by a pendent fretwood ornament. The cornice of the house is inconspicuous, and is sometimes battlemented or crested [Illustn. xxxiv].

The exterior door of the house is more or less ornamented, according to the im-

* Somewhat similar to brick-nogging in England.

portance of the habitation; not unfrequently the coat of arms of the proprietor forms part of the ornamentation. The wooden doors, which are very heavy, have generally an iron knocker and a wooden lock; sometimes they are cased with iron, and there is usually a mounting-stone by the side. The gate is locked by pushing forward a strong wooden cross-bar, which, during the daytime, is thrust back into a horizontal hollow in the wall. In addition to the principal door, the great houses have usually a small secret one, opening into another street, to serve as a means of escape for the proprietor in case of danger.

The entrance is by a more or less narrow dark vestibule, which always forms one or two angles to prevent seeing into the court. In the corner of the first angle is the seat of the porter (bowwáb). This entrance, fortress-like, is sometimes defended by two heavy doors.

Having passed the vestibule, we enter the court (hósh), into which the principal apartments look. The courts, in which a considerable part of the Arab family life is passed, are wholly or partially paved; on festive occasions a tent-cover is stretched over them, and they then serve as a large hall for male visitors [Illustn. xxxv]. Trees give shadow to a court, when there is space enough for them, and a fountain or draw-well is always to be found in it.

In the court we have, first, the takhtabósh, which does not, however, always exist in the Cairo house. This is a square open hall, facing the north; on three sides it is furnished with wooden benches; it is either on a level with the court, or raised by one or two steps. The ceiling is of wooden fretwork in the natural wood colour, only relieved by vermilion-coloured stripes. Here people of lower social rank are received and ordinary business is transacted.

Adjoining the takhtabósh is the mandarah,* the men's principal room [fig. 104]. It has a wide wooden grated window, or two windows of this kind, next the court. In its architecture and decorations it resembles the ka'ah [fig. 105], or drawing-room of the hareem.

In the court we also meet sometimes with an apartment [fig. 106, A], paved with marble, which is a sort of summer saloon, on one side of which refreshing water flows in a thin stream over ornamented and somewhat inclined marble slabs, and gathers at the foot in a marble channel, to be conducted thence to a centre basin with a fountain jet.

A small but always richly ornamented door leads from the court up to the hareem, and over it an embroidered curtain is usually hung.

Upon the first floor in rich houses we have the mak'ad,† which is a room having an open front towards the court, with two or more arches supported upon a central column or columns. It has a paved floor, and sometimes a dado of marble mosaic; its ceiling is of wood, with carved beams, generally about a foot apart, richly painted and sometimes partially gilded; it is accessible from the court by a staircase, the door of which can be locked. Adjoining it is the master's office or study, which sometimes

* Pronounced Mandar'ah. † See fig. 110 (H), p. 231, and Illustn. xxxix.

serves as a temporary guest-room. The arched side of the mak'ad is always turned towards the north; it is used for receptions during the hot summer months.

Amongst the apartments of the hareem the room for feasts is called ka'ah; in its architecture and decoration it has much in common with the mandarah. In both we distinguish two parts—the durka'ah, B, and the leewán, C, the passage and place for the attendants. The floor is ornamented with marble mosaics; in the mandarah we sometimes find a fountain, A, in the middle; along the wall opposite to the entrance door is a kind of sideboard (suffeh) in stone or marble, about four feet high, supported by two or more arches, under which are placed the basin and ewer for washing before and after meals, and for the ablutions preparatory to prayer, and upon it are kept water-bottles, coffee-cups, &c. Very often the arches of the suffeh are faced with mosaic, and sometimes the wall behind the arches and above it, to the height of about four feet or more, is decorated with mosaics and faience tiles. The raised part of the floor of the room on both sides of the durka'ah is called leewán. One of these is usually larger than the other; it is generally paved with common stone, and covered with a mat or carpet, and there are divans, D, along the walls. The walls are wainscoted to the height of about seven feet above the divans, or adorned with marble mosaics. Between

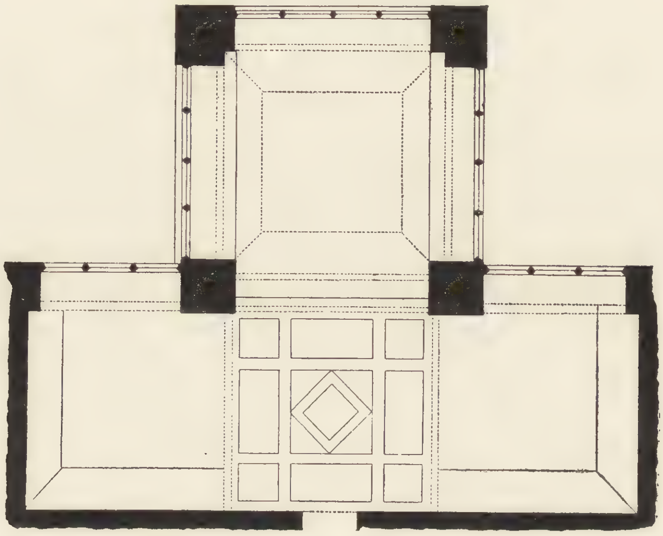

Fig. 104.—Plan of a Mandarah, or Men's Reception-Room.
[See figs. 112–115, pp. 234–35, and Illustn. xxxviii.]

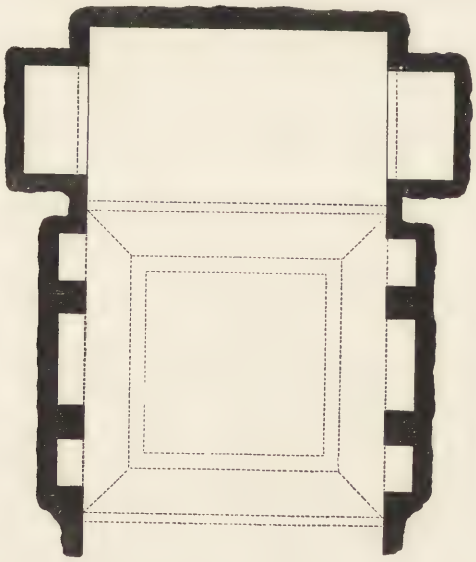

Fig. 105.—Plan of a Ka'ah, or Women's Reception-Room.

the wainscoting there are generally two or three shallow cupboards in the walls, their doors being composed of small panels ornamented with geometrical designs. Just above the cupboards runs a narrow shelf of wood, where brass and china vessels, &c., are kept. In the mandarah there is sometimes, in the height of the wall, a window or balcony screened with lattice woodwork, and which belongs to some upper room; this is constructed so as to allow the ladies to see the male guests in the room, or to screen female singers performing for the pleasure of male guests on festive occasions. That part of the wall between shelf and ceiling is covered with faience tiles, or decorated with stucco ornaments, or simply whitewashed. The ceilings of ka'ah and mandarah correspond in division with that of the floor in durka'ah and leewán. The ceiling of the ka'ah is somewhat more elevated than that of the mandarah, and it has a wooden cupola over the part corresponding to the durka'ah. These various parts of the ceiling are constructed of wooden beams, generally about a foot apart, and divided by wooden arches which repose on stalactite consoles. Around the wall and immediately below the ceiling runs a wooden moulding with stalactite ornaments in the corners. This moulding is richly painted and gilt, and ornamented with Arabic inscriptions; the cupolas, ceilings, arches, and consoles are also painted, and sometimes gilt. In older buildings the dividing arches of the ceilings, as well as the cupola over the durka'ah, were constructed in masonry. The difference between mandarah and ka'ah is that the former is usually without cupola or skylight, as there are generally rooms on the floor above it. Not unfrequently it has also only one leewán; in that case the durka'ah is at the small end of the room, whereas at the opposite side is a meshrebeeyeh, with coloured glass windows above which give light to the room. These very lofty rooms are aired by railed openings situated in the top of the walls. The other rooms in the upper part of the house are without interest, except the bath, which is generally covered by a dome; this dome is formed of gypsum in very pretty designs, and has a number of small glazed apertures for the admission of light.

The horse-shoe arch is commonly considered a characteristic of Mohammedan architecture; it may, therefore, be well to mention that its application in Cairo is not very frequent. In the remains of all the Arab houses which I have seen—and the number is almost exhaustive—I have only come across two cases in which the arcades of the mak'ad are horse-shoe-shaped.*

In the Cairo Arab house all decoration, exterior and interior, is the work of the architect, and not of the decorator or upholsterer. The exterior of the house is very plain, and all ornamentation, if any, is lavished upon the entrance. In the court we find the side facing the north to be the most richly embellished,—in fact, one might feel inclined to compare it to the façade of a European house. It is much to be regretted that this style of house-building, which is so very suitable for the conditions and

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* Count d'Hulst probably alludes to the circular horse-shoe arch as found in Spain and Morocco. The pointed arch in Cairo is always stilted, and the curve is continued below the centre of the arch; the only difference is that the latter arch is struck from two centres.—R. P. S.

requirements of a climate where outdoor life is so much resorted to, and which is at the same time so artistically beautiful, is rejected for buildings *à la Franca*, whose suitableness for the climate and requirements of life in Egypt is very doubtful, and whose artistic merits leave much to be desired. How well Cairene architecture can be adapted to our modern requirements, how pliable it is, and what really handsome and artistic effect it is possible for it to produce, is shown in the house of the French Consul-General, which is better known as Count St. Maurice's house. It is constructed entirely of ancient material, most carefully repaired, and forms an excellent example [Illustn. xxxvi].

It is to be regretted that the late Khedive, Ismail Pasha, seems to have been devoid of artistic culture. If only part of the enormous amounts which were wasted during his reign upon lath-and-plaster buildings had been spent in the right direction, he would have occupied an important place in the history of Cairene architecture, have created a valuable staff of craftsmen, who are only too conspicuous by their absence, and, by reviving ancient industries, brought a new source of wealth to the country, which is of importance to a merely agricultural country like Egypt; and, last but not least, have retained and augmented the fame of Cairo as an essentially Oriental town—a reputation which it is now fast losing, for the natives, considering imitation the sincerest flattery, are always assiduous in following example given from above. But as the case stands, all these ancient houses are doomed to an early ruin, where they are not already, as in most cases, wrecked beyond repair. It would seem desirable to have at least one or another of them restored, and kept up, as it were, for an example; yet even this, though it would only require a comparatively small sum, appears to be altogether beyond hope for the present.

Local taste, fashion, and local exigencies, which are very important factors in Egyptian art, have been too often overlooked; they existed in former times, and are still to be found at the present day. Thus in towns of the Lower Delta and along the sea-shore, as Alexandria, Rosetta, Mehalla-el-Kebir, Samanoud, Mansurah, Damietta, Menzaleh, &c., we come across an altogether different style of building, viz., of brick. The traveller who visits these, mostly out-of-the-way places, is strangely surprised to see houses whose beautiful workmanship is really worth remarking. Almost at each step interesting details crop up, which increase by a walk through the towns, where we meet with whole fronts erected in a pure and peculiar style.

The houses in these towns contain several floors, and are exclusively constructed of bricks. The upper floors are mostly projecting, and the brickwork of the ground-floor is most carefully executed. What attract most are the doors and doorways, which are ornamented with delightful geometrical designs in a kind of mosaic composed of thin pieces of red and black bricks, whose furrows are filled in with white plaster, and inlaid in the brickwork; in buildings of more recent date, this mosaic is frequently merely imitated in painted plaster. But this is only one mode of embellishment; another consists in the utilisation of the brick to constitute itself the intended design. Frequently in this case, as in that of the mosaics, the joinings are made

without mortar, and the accuracy of the workmanship is absolutely remarkable. It is notable that, notwithstanding great technical knowledge, no trace of moulded bricks has been discovered, not even of arch-stones, except in a small door of the Kait Bey Mosque, in the Fayum.

In Rosetta we hardly come across a house which has not a pillar placed in its front, viz. at the angles: thus the corners are chiefly ornamented. This superabundant richness of columns—for instance, those of El-Zaghloul Mosque, which contains above 230—comes from the ancient Bolbitine, upon whose ruins the modern Rosetta has been built.

The woodwork of the windows in Rosetta and Alexandria houses consists chiefly of turned wood, which is, however, much less elaborate than at Cairo. In Damietta Mansurah, Matarieh, &c., this work is replaced by a kind of railing made of fretted strips of wood, which form very elegant designs. The ceilings in these houses are wooden beams covered with planks, and as a rule unpainted. The wooden doors are carved, and have generally a smaller door in the centre, which is used for ordinary entrance and exit. Sometimes the door of a dwelling or sebeel, and more frequently those of the mosques at Damietta and Mansurah, are ornamented with a flat cornice in wood carved in geometrical designs, which projects on both sides over the door, and forms a polygonal to both the upper sides of the door. The roofs of the houses are flat.

All these towns of the Lower Delta have a number of portals of mosques with pendentives entirely constructed of bricks. The interior arrangement differs considerably in the various places. At Rosetta the ground-floors are exclusively devoted to warehouses and offices; a separate door gives access to the private dwelling, on entering which we find a staircase leading up to the first floor. On this and the upper floor the arrangement is very much in the Italian style, with the addition of a kind of large recess in the rooms raised about a foot from the floor, four feet deep and ten feet long. On the two small sides of these bays are cushions forming a divan, the room itself being equal to the durka'ah, and the bay to the leewán of the Cairo house. A peculiarity is that the staircase of the house very frequently projects to half its breadth. In Mehalla-el-Kebir and Damietta the interior arrangements are very much like those at Cairo, only less rich and entirely constructed of bricks; in the latter the ground-floor wall is frequently built of limestone. In Damietta, as well as in other places mentioned, the house forms three sides of a square. The entrance on the open side leads into a place partly court, partly hall, having a roof only in that part which is built over; this place serves for reception. In larger houses a reception-room for men adjoins it, and with it a door communicates leading to the upper part of the house. In Damietta and Menzaleh we frequently find, as cornice of these houses, a cove formed by oversailing brickwork. Another style of brick architecture which is interesting, and rarely to be found except in the doors of mosques and okallas, is met with at Assiout. The private dwellings there are, however, of slight interest, having only recently emerged from the condition of the village house.

These brick constructions, being mostly in a ruinous state, are fast disappearing, their materials being used for new buildings; yet I think all these places would well repay a thorough exploration. What notes I have been able to gather were made during a rapid visit; and, as these towns are seldom traversed by Europeans, it would require a stay of several days to ensure going about freely without being followed by a crowd, which renders it impossible to see much of the interiors.

R. D'HULST.

[Notes by R. Phené Spiers, F.S.A., *Member of Council.*]

Broadly speaking, Saracenic domestic architecture * derives the inspiration of its more architectural features from religious buildings, such as mosques and tombs; this is the rule, in fact, with most architectural styles. With the exception of the meshrebeeyehs and stone corbels already referred to, the entrance doorway, and the battlement or cresting which sometimes crowns the walls, and, in rare cases, a string-course or ornamental band, are the only architectural features of the exteriors.

The entrance doorways are sometimes simpler versions of the magnificent portals which are the characteristic features of Mohammedan architecture—that is to say, the doorway is placed at the back of a square niche, which rises the whole height of the building, and is arched over with a stalactite vault. Generally speaking, however, the domestic doorway is about 5 feet wide, and from 8 to 10 feet high, with a pointed or a segmental arch and square reveals; its decoration is confined to the elaboration of its voussoirs, and to its enclosure (as well as that of a window above) within a flat decorative moulding of two fillets and a hollow between, constantly crossing over and interlacing. This band (which is sometimes carved with flat ornament), and the painting in red of the alternate voussoirs of the arch and of the horizontal courses of stone, comprise the principal scheme of decoration adopted, and is one productive of the greatest variety. The corbels which carry the projecting upper floors are generally in stone, and are inclined slightly upwards, apparently to give increased strength.

Passing into the chief court, the principal architectural feature is the mak'ad, or open gallery, placed always on the south side of the court so as to face the north. This gallery is raised 8 to 10 feet above the level of the court, and opens on to it through two or more arches carried on columns, with a wooden balustrade in front. The architectural design of this gallery was originally derived from the arcades surrounding the courts of a mosque, and it is a direct imitation of the belvederes or open galleries over the sebeels, or public fountains, which are occasionally attached to mosques, as in the case of those of the mosques of Barkúk and Kait Bey.

In both cases this belvedere is further protected from the vertical rays of the sun by a projecting hood in timber, carried on brackets with elaborate pendent brattishing;

* Consult *Architecture Arabe ou Monuments du Kaire, mesurés et dessinés, de* 1818 *à* 1825, *par* Pascal Coste. Paris. gr. fo. 1839. Also M. Girault de Prangey's *Monuments Arabes d'Égypte, &c., dessinés et mesurés de* 1842 *à* 1843. Paris. fo. 1846–52.

LXXIII THE ARAB HOUSE OF EGYPT (xxxiv).

From a photograph.

A STREET VIEW IN CAIRO.

[See page 222.]

LXXIII. THE ARAB HOUSE OF EGYPT (xxxvii).

From a photograph.

MARBLE MOSAIC DECORATION IN THE BORDHENY MOSQUE, CAIRO.

[See page 234.]

most of these have now disappeared. Sometimes meshrebeeyehs have been fixed over all or portions of the mak'ad, suggesting that it has been appropriated by the ladies of the hareem.

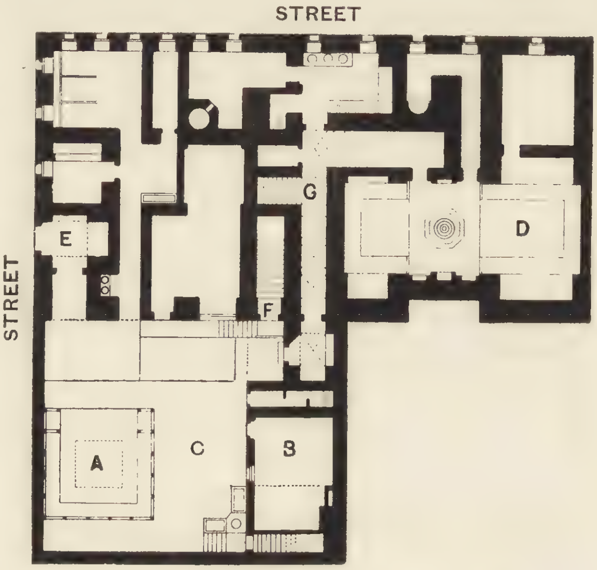


Fig. 106.—A House in Cairo: Ground Plan.

Fig. 107.—A House in Cairo: First-Floor Plan.

A, Summer Reception-Room. B, Servants' Rooms. C, Court. D, Mandarah. E, Entrance. F, Stairs to Mak'ad. G, Stairs to Hareem. H, Mak'ad. J, Master's Office or Study. K, White Slaves' Rooms. L, Guests' Room.

Passing now to the reception-rooms, the finest earliest ceilings, cornices, and lanterns are those found in the mosques. It is probable, therefore, that it is on such models that those found in private houses are based. The absence of plans of these houses and their reception-rooms has rendered it somewhat difficult to follow Count d'Hulst's Paper, and it is singular that so few plans should ever have been published. It is possibly due to this fact that so much diversity of opinion exists in the distinction which is drawn between the mandarah and the ka'ah. Mr. Stanley Lane-Poole observes in his work on *Saracenic Art* that the ka'ah is loftier than the mandarah. In the only important example, however, given in Coste's *Architecture Arabe* (which is drawn out in fig. 110, p. 231), the mandarah, being on the ground-floor, rises through three floors, whilst the ka'ah is on the second floor and consists of only one storey. Mr. Frank Dillon's drawings of both kinds of reception-room suggest that there is not this distinction. As a rule, however, the ka'ah is generally lighted by a lantern over the durka'ah, or central portion; whilst in the mandarah there is generally a flat ceiling, and there are side windows. There are also one or more fountains in the mandarah not found in the ka'ah. The leewáns in the

mandarah are deeper than their width, whilst in the ka'ah they are comparatively shallow recesses.

Count d'Hulst has pointed out that the portion of the ceiling over the durka'ah is loftier than the rest of the room. There is another distinction—the construction of the ceiling over the leewán is visible, with beams about 10 inches wide and 18 inches apart, the soffits of which are carved at each end, and round or octagonal in the centre; and the interspaces are decorated with small square or oblong coffers. Over the durka'ah the ceiling construction is masked by flat geometrical patterns, formed, some say, by nailing pieces of wood on; but I think more often framed together in that elaborate system which would drive our joiners to despair. At all events, to the eye it forms a flat network of ornament, which is relieved by various colours.

Fig. 108.—A House in Cairo: Second-Floor Plan.

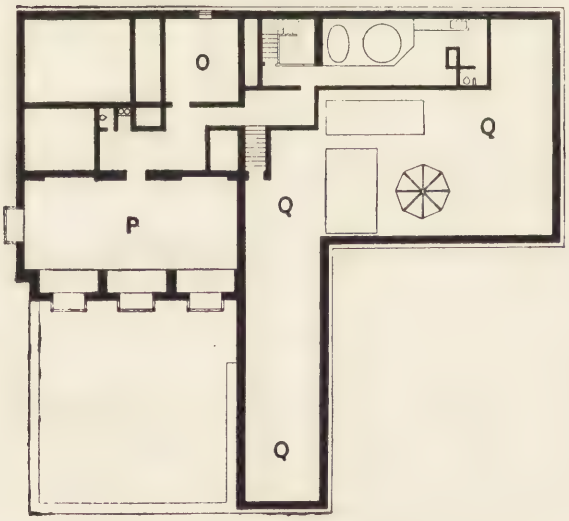


Fig. 109.—A House in Cairo: Top-Floor Plan.
L, Married Guests' Room. M, Ka'ah. N, Wardrobe. O, Eunuchs' Room. P, Fête-Room for the Hareem. Q, Terrace-Roof.

Under the ceiling of both one and the other runs a deep cove, with stalactite corbel-brackets in the angles and centres. Sometimes in very large rooms the coved cornices will be 3 feet to 4 feet deep, with triple rows of stalactite carvings. In all cases these ceilings are richly painted in flowing ornament of various patterns, and partially gilt. The openings between the durka'ah (the highest portion of the room) and the leewán, and between the latter and its recesses, are spanned by beams supported on curved brackets and carried on stalactite corbels, the whole being elaborately carved, painted, and gilded.

The elaboration, in colour, of cove and ceiling would be too strong were it not for the repose which is given by the wall-surface below it (from 4 feet to 12 feet in height),

which is either simply whitewashed, or covered with flat stucco ornament, or faced with Persian tiles, the lower part of the room, as described by Count d'Hulst, being panelled with wood, or lined with marble slabs and mosaics, or with Persian tiles. This dado rises to a height of 7 or 8 feet, being crowned with a shelf which is sometimes carried on brackets and sometimes on a stalactite cove. The raised portions of the

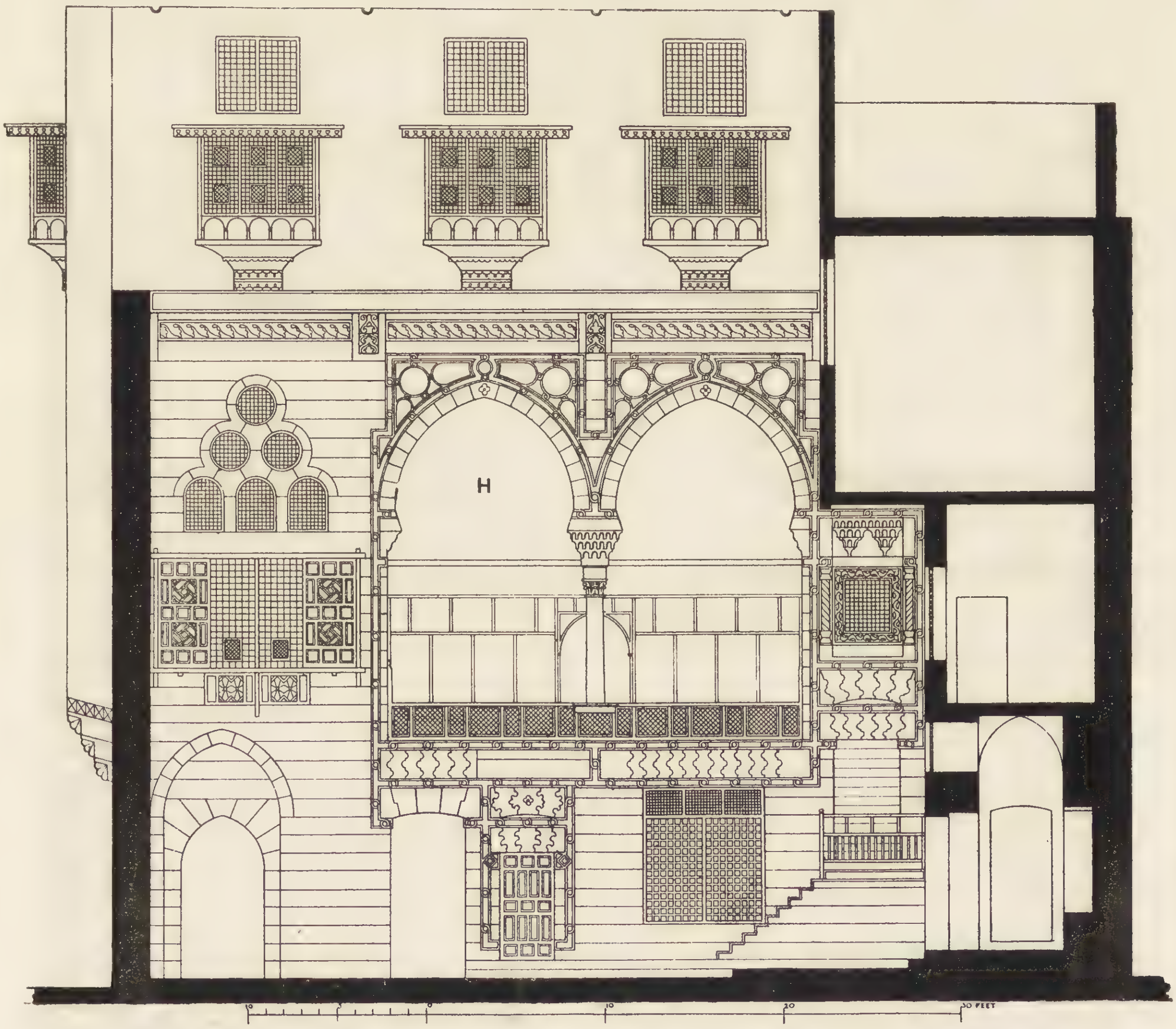


FIG. 110.—A HOUSE IN CAIRO: THE COURTYARD. (From COSTE'S *Architecture Arabe.*)

floor are simply paved, as they are subsequently covered with matting and carpets. The centre portion, the durka'ah, is paved, in important houses, with geometrical mosaics of great beauty, one of the most remarkable specimens being found in a house known as that of the Mufti, which I was fortunate in being able to measure and draw out when in Cairo in 1866. [Figs. 112–115, and Illustn. xxxviii.]

The plans [figs. 106–109] and sections [figs. 110, 111], which have been reproduced

from drawings made after Coste, have been already referred to, but some of the rooms shown therein have not been described. On the ground-floor plan [fig. 106] the staircase in the bottom corner of the court leads to the apartments, L, of married guests, there being a special passage on the second floor leading thence to the Hareem. The

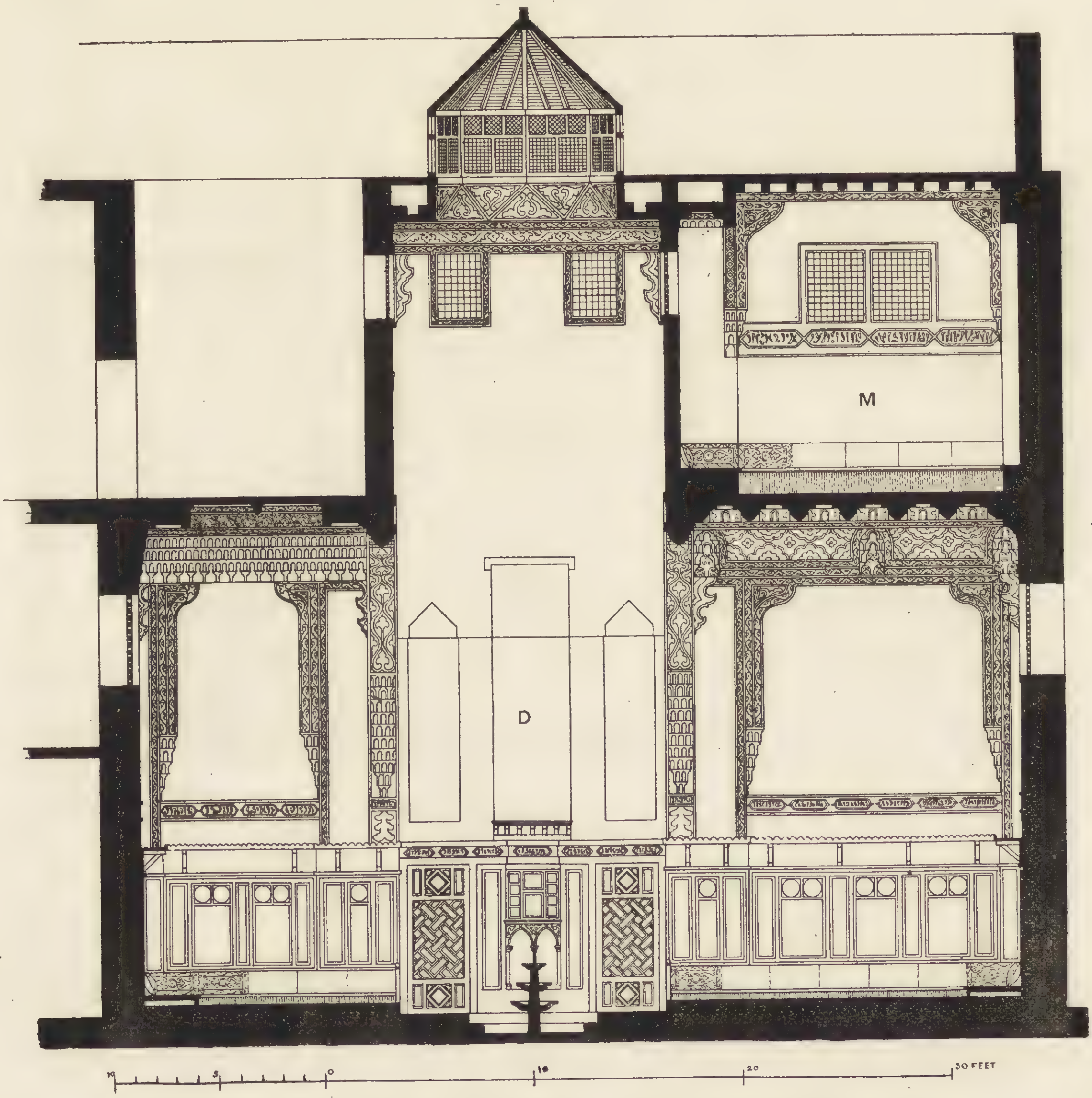


FIG. 111.—A HOUSE IN CAIRO: THE MANDARAH. (From COSTE'S *Architecture Arabe.*)

ground-floor room, B, is appropriated to servants. The entrance to the Hareem is by a doorway near F (the master's staircase to the mak'ad); stairs beyond lead to the first floor, and other stairs are in the rear, for ascent to the second or top floor. By the side of this staircase on the first floor [fig. 107] are bath-rooms with domed ceilings,

mentioned by Count d'Hulst. These domes are perforated with holes filled with coloured glass, a method of construction and lighting handed down from time immemorial, and of which there are existing examples, built by the Sassanians in the fourth century, at Serbistan, in Persia. The rooms, KK [fig. 106], are for the Hareem attendants, one perhaps being that of the eunuchs in charge. There is a large room on the third floor, the "meshrebeeyeh" windows of which are seen on the section [fig. 110]; it would seem to be an additional ka'ah, the example, M [fig. 111], in this house being smaller than usual. Q Q are flat roofs [fig. 109] over rooms below. It will be noticed that the mandarah, D, in this house is exceptionally lofty, and that it is lighted by a lantern, such as is usually found in a ka'ah but not in a mandarah. The section, shown in fig. 111, is taken through this mandarah, and it illustrates much that has been already said as to the architecture of this apartment. Thus in the centre, called the durka'ah, beneath the lantern, is a fountain; the less lofty portions of the room are ornamented with a high dado, in this case, of panelled woodwork, with niches or small cupboards. The ceiling of this division is constructed of beams as described, that of the smaller division opposite (on the left)—the part of the mandarah in which musicians perform for the delectation of guests—has a stalactite coved cornice and a ceiling ornamented with panelled woodwork picked out in colours and gilded. The section shown in fig. 110 is a good illustration of the mak'ad, H, on the first floor, the projecting hood which formerly surmounted it being missing. At the back of the mak'ad is a screen forming a private passage [fig. 107] to the master's room. The service portion of the establishment is placed on the ground-floor, on the south side, consisting of kitchen and bakehouse; on the left are the stables. I have given a perspective view [Illustn. xxxix] of another mak'ad which has two columns carrying the arches.

A plan of the mandarah in the "House of the Mufti" is given in fig. 112; in the centre of the durka'ah, B, is a fountain, a view of which, reproduced from a photograph, is given in fig. 113. The pavement of this fountain, and of the square portion of the hall in which it is placed, is of white marble [Illustn. xxxviii]; the panels and decorative lines are inlaid with marbles of various colours in geometrical patterns. These are set out by the artist on the ground—not copied from drawings—a much greater variety in design being thereby obtained, in harmony with the material and the size of the tesseræ at his disposal.

For the decoration of wall-surfaces such as in a dado, a different method is employed; it has been described by Mr. Stanley Lane-Poole in his valuable treatise on *Saracenic Art* (page 119). "Each piece of marble or tessera of this or "other material, having been bevelled from face to back, the old mosaic is laid out "on the ground, face downwards, and strong plaster is poured over it, which, entering "the interstices at the back, binds them together into one slab. Pieces of reed are "then laid across the wet surface to strengthen it, and more plaster is poured on till "the thickness is about two inches. Large surfaces can thus be bound together, lifted, "and plastered to the wall, without breakage. The bevelling of the edges not only

"gives the plaster a grip on the tesseræ, but saves labour in fitting the pieces together: "for, instead of the whole of the sides having to be exactly parallel and accurately

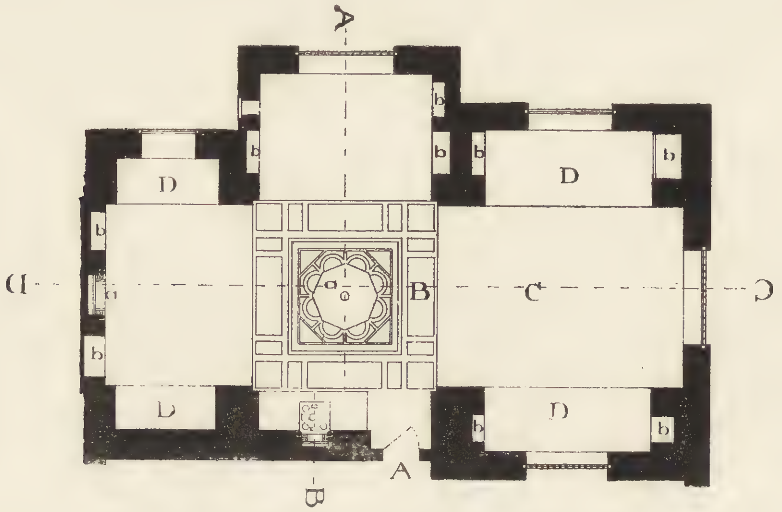


Fig. 112.—Mandarah in the House of the Mufti: Plan.

"fitted to the adjoining side, only the faces and the top edges of the tesseræ and slabs "have to be ground, so as to form accurate junctures at the front alone, and the backs "and sides are left quite rough." Strips of "mother-of-pearl" are used to form borders, and occasionally interlaced panels, such as are seen in [Illustn. xxxvii.] the Bordheny Mosque at Cairo. Large pieces of porphyry and other marbles are some-

Fig. 113.—The House of the Mufti; the Fountain in the Durka'ah of the Mandarah.*
(*From a photograph.*)
[See figs. 112, 114, 115, and Illustn. xxxviii.]

times used in these wall mosaics, producing much the same effect as that produced by the *opus Alexandrinum* of Italy. It is evident that such a system of imbedding for

* See further, Transactions Vol. IV., N.S., Illustn. iii., for a view of the interior of this Mandarah, entitled "A House in Cairo," being the reproduction of a photograph lent by Mr. W. Brindley, F.G.S.

wall-panels as that described by Mr. Lane-Poole would not do for a pavement, because the lines of junction would increase in width as the pavement became worn, owing to the bevelling off of the back of the tesseræ. Portions of the fountain, however [figs. 112, 113], in the centre where under water, and on the sides, would appear to have been put together in this way. This system of bevelling is applied also to the voussoirs of the arches of the mihrab or niche, indicating the position of Mecca, towards which the Mohammedan turns his face when at prayer. In Romanesque work, the voussoirs of an arch, especially in the case of a flat arch, were prevented from slipping by a joggle or a rebated joint. The Saracenic architects, however, went further than this; the line of junction is composed of a series of curves, so intricate that their fitting together with a hair-joint would seem to be impossible. Sometimes this intricate marble design is only a veneer, but there are numerous instances in which

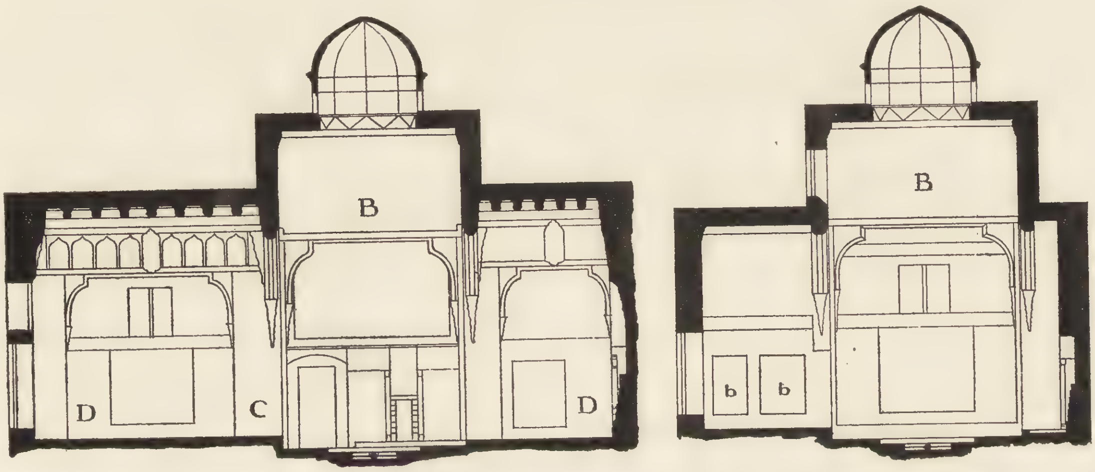


Fig. 114.—Section on the Line C . . . D.
[See fig. 112.]

Fig. 115.—Section on the Line A . . . B.
[See fig. 112.]

Mandarah in the House of the Mufti.

the voussoirs are 4 inches to 6 inches thick. In both cases this accuracy of joint is obtained by bevelling off the back of the voussoirs and grouting the hollow spaces left with liquid mortar.

On the right-hand side, on entering, is the principal leewán, c, the floor of which is raised, like a dais, about a foot above that of the durka'ah, b, with two recesses, d. On the opposite side is also a raised floor, or leewán, at the back of which is a wall-fountain, *a* [fig. 112]. Another wall-fountain, also in a recess, is to the left of the door, a. The depth of these recesses is about 10 inches. From a height of about 4 feet from the pavement the water trickles over a marble shelf on to a raking marble slab, the lower portion of which is about ten, and the upper three inches from the wall. This slab is indented to catch the water as it trickles, and it is flanked on each side by a band of inlaid mosaic work; while at the extreme outside are vertical troughs forming steps, one in front of the other, over which the water falls into a square marble basin,

inlaid with mosaic work—refinements suggested, no doubt, by the delight experienced in hot climates at the sound of falling water. The small wall-recesses, *b b b*, are cupboards.

In the House of the Mufti the mandarah is lighted by windows on three sides of the principal division, and also, in the upper portion of the durka'ah, by windows known as "kamareeyehs," which are formed of pieces of coloured glass sunk in an arabesque pattern, in which gypsum takes the place of lead, as in our leaded lights or windows. Whilst on the outside the gypsum bars and glass are almost in the same plane, on the inside the glass is set back from half to three-quarters of an inch. The soffit is horizontal. The sill of each bar is bevelled downwards. At a great height, therefore, such as would be the case in the durka'ah, the glass is scarcely visible, and what the eye sees is the reflection from the soffit of the gypsum. The light near the glass is stronger than at the extreme edge of the gypsum, producing a gradation of tint which is very beautiful. It requires, of course, the intense brilliancy of an eastern sky to give full value to this effect of gradation. Several specimens of this kind of Oriental window are exhibited in the South Kensington Museum, but as they are not placed against the external window openings, so as to get even the diminished light of an English sun, their true effect cannot be realised even to a small extent.

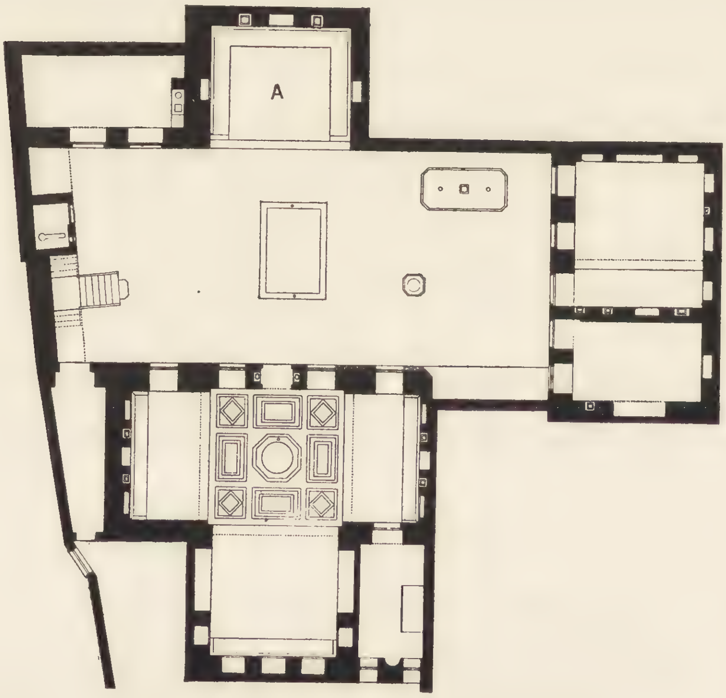
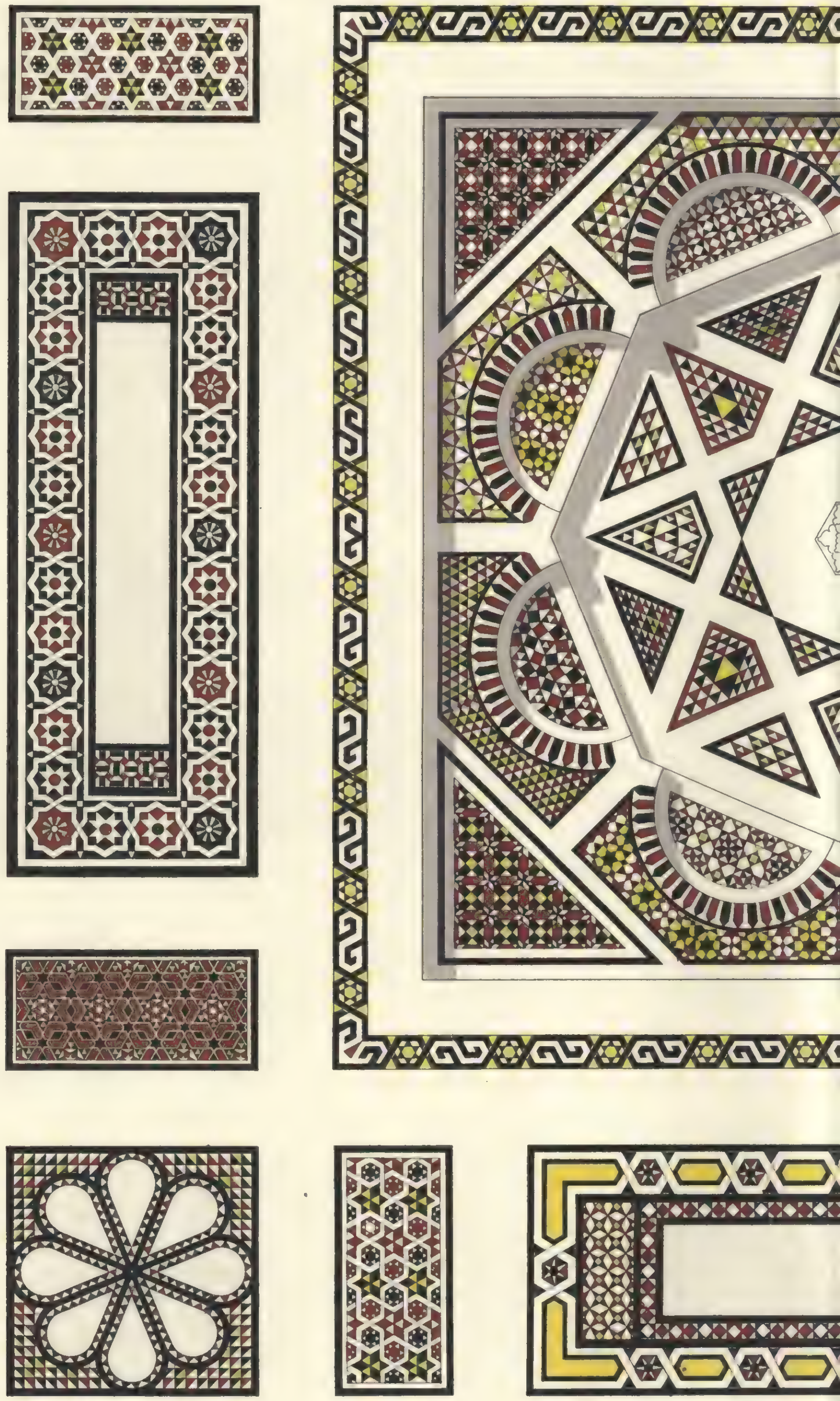


Fig. 116.—House at Damascus: Ground-Floor Plan.

A plan of an ancient house at Damascus is shown in fig. 116. This, in the year 1866, was a small inn or hostelry, at which I stayed, taking the opportunity of measuring it and making a sketch of it. Containing no complicated arrangements of plan, such as are found in the Cairene houses, it is consequently difficult to say for what purpose it was originally erected. On the ground-floor is a large open court, with a fountain in the centre, a magnificent orange tree, and other plants. On the south side, facing north, is the room, A, which responds to the takhtabósh of a Cairene house, with a leewán

LXXIII. THE ARAB HO



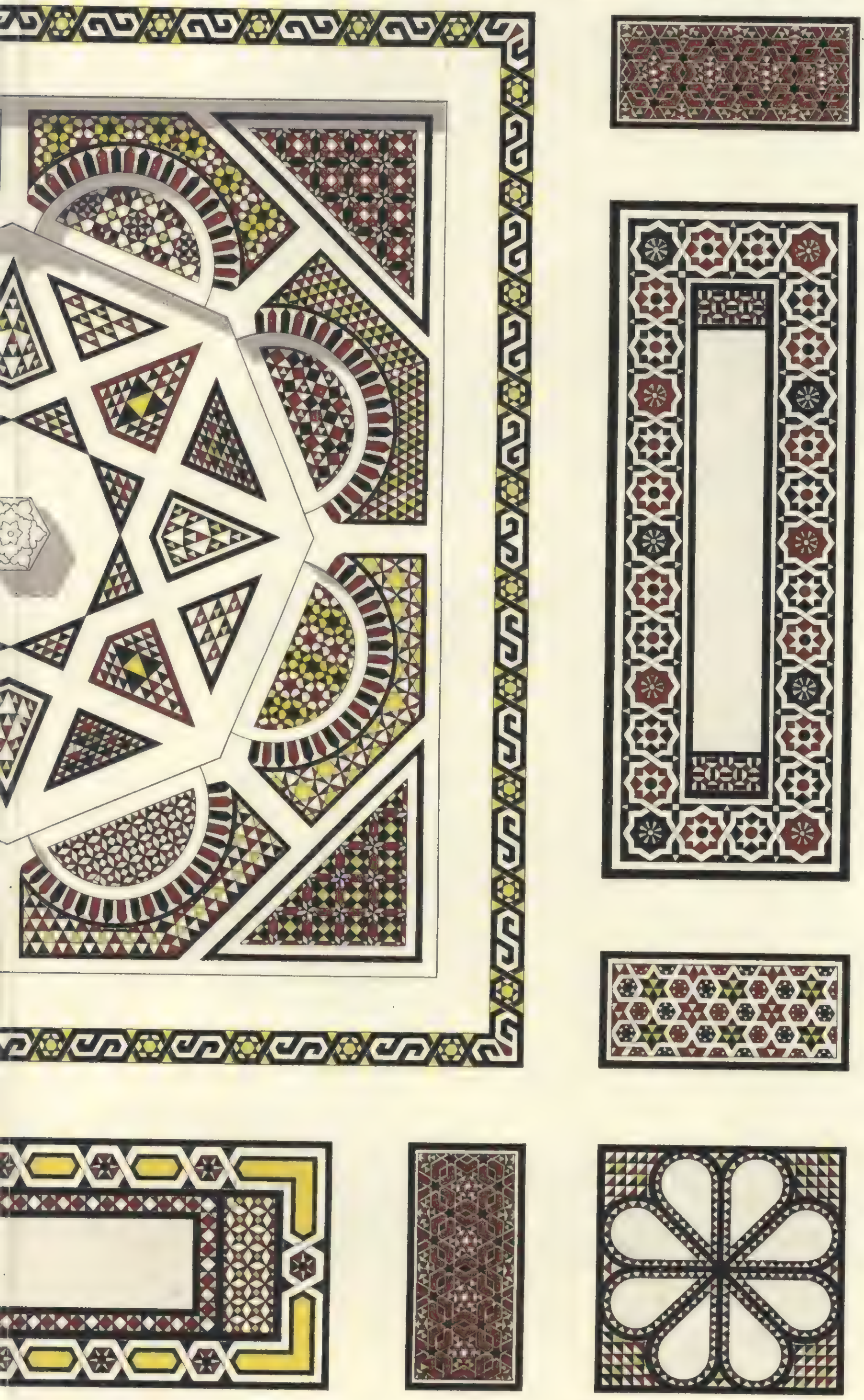
R.Phené Spiers, mens. et del

MARBLE PAVEMENT IN THE

[See pp.

OF BRITISH ARCHITECTS, VOL.VI, NEW SERIES.

OUSE OF EGYPT. (XXXVIII)

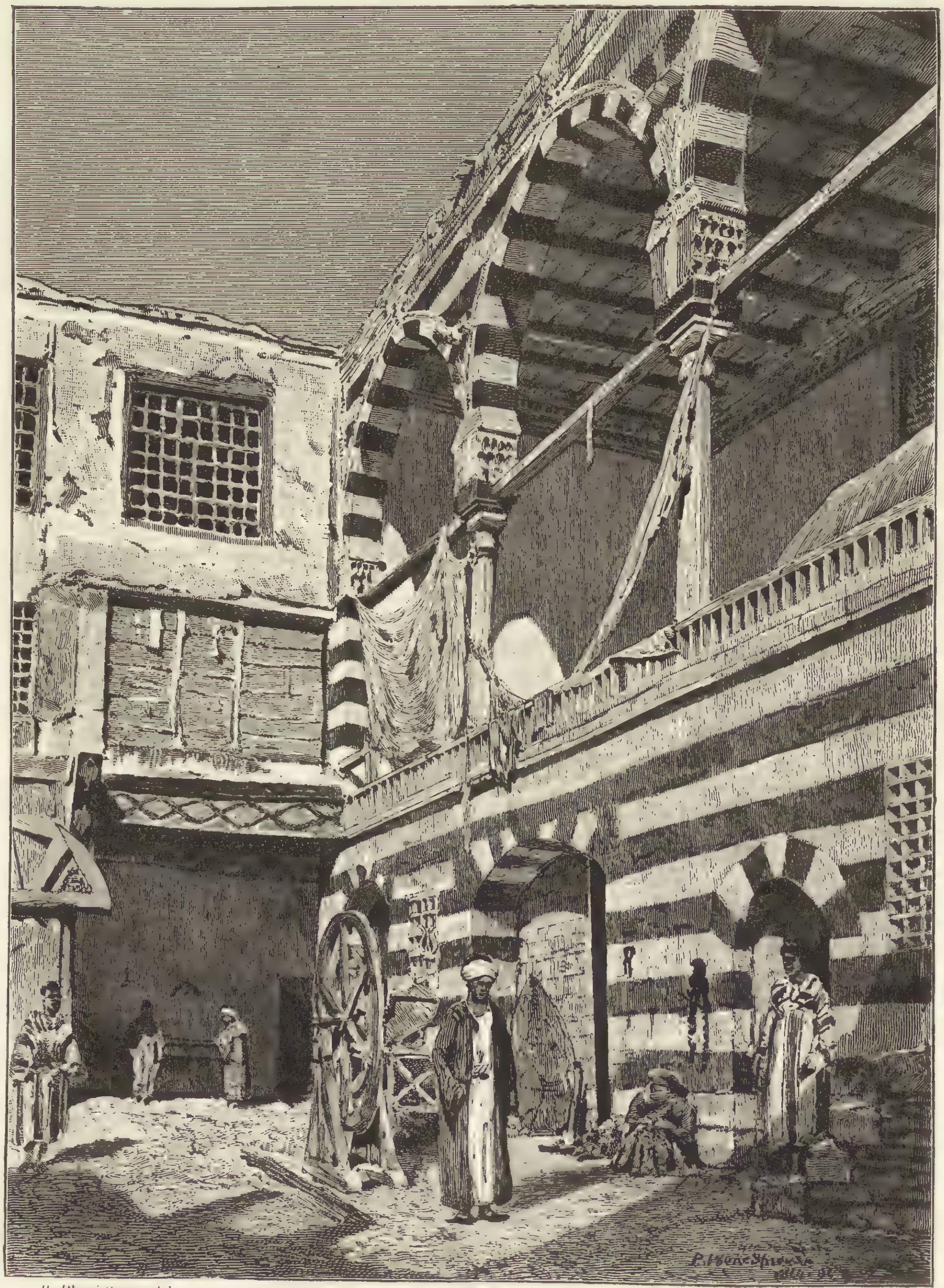


C. F. KELL, LITHO, 8, FURNIVAL ST HOLBORN, E.C.

OUSE OF THE MUFTI," CAIRO.

31-235.]

LXXIII. THE ARAB HOUSE OF EGYPT (xxxix).



R. Phené Spiers del. J. D. Cooper sc.

COURT OF AN OLD HOUSE AT CAIRO.

[See page 233.]

open to the court and used in summer. A similar feature is found in the French Consul's house and other houses at Damascus. By the side of this leewán, on the left, is the kitchen; while opposite is the apartment called in Cairo the mandarah, with its durka'ah or vestibule, on three sides of which are leewáns, that in the centre being the largest and principal one. Of the two other rooms on the right of the court, one was used as the dining-room of the inn. The bedrooms were on the first floor, and opened into a gallery round the court, reached by a stair shown in the plan, on the left-hand side. As in Cairo, the centre portion of the durka'ah was the loftiest part of this mandarah. Instead of the timber beams or curved brackets of the Cairene house, stone arches resting on stalactite corbels covered the openings to the leewáns; and their voussoirs, alternately red and white, were decorated with stencilled patterns of geometrical design. The ceiling beams, instead of being carved, were painted with gesso in relief and afterwards decorated and gilded. This system of painting in gesso is more frequently adopted in Damascus, and the two reception-rooms brought from Damascus, now exhibited in the South Kensington Museum, are good examples of the class of decoration used in Syria and Constantinople, in place of the painted woodwork and marble linings of the Cairene houses. The style is far from being as pure in design, but in variety and play of colour it has greater attractions. Its tendency, however, is to decadence, and some of the later mansions erected in Damascus, notably that of the French Consul, abound in decoration of a showy but debased type, as if the vagaries of Louis XIV. and Louis XV. had been engrafted on it.

In conclusion, I can only join with Count d'Hulst in bewailing the destruction of these beautiful works of art, many of those in Mr. Frank Dillon's drawings * having already been pulled down, and their decorative features broken up or stolen. In this respect I am afraid Europeans are to blame, and even Count St. Maurice (to whom Count d'Hulst refers) is responsible for the destruction of a great deal, having been given a free hand (so I am informed) to appropriate for his own house any little accessories he might come across which attracted his fancy. I was taken to the so-called House of the Mufti by some dilettanti only after they had detached as many Persian tiles as they could carry away.—R. PHENE SPIERS.

[Notes by JOHN D. CRACE, *Hon. Associate.*]

The general description of the "Arab" house of Cairo will not fail to convey an idea of a residence in which all the conditions of climate, customs, and comfort have

* At the Meeting of the Institute, when Count d'Hulst's Paper was read, fifteen water-colour drawings, by Mr. Frank Dillon, R.I., were exhibited, viz.:—

(1, 2). Mandarah and Fountain, in the House of the Mufti, belonging to Scheik-el-Makad;
(3–8). Mak'ad (two views), Ka'ah, and three exteriors of the House of Raduan Bey;
(9–12). The Mandarah, Court, and Mak'ad, Ka'ah, and interior of Court of House of Scheikh Sâdât;
(13). Mahkameh, or Court of the Cadi;
(14). Carpet Bazaar, Cairo;
(15). Mosque of Mahomet-Bey, with meshrebeeyeh.

been adequately and elaborately thought out. A people could only build like this when there was considerable commercial prosperity and security, and when highly skilled labour was available.

What must strike every observant visitor to these old houses is the thoughtful and consistent beauty of the detail; and, in some cases, its costliness and elaboration. I much doubt whether any other recognised style of architecture can show so much variety of invention in the detail, or so little stereotyped repetition.

Of the ingenuity of much of the ornamentation those will judge best who have ever attempted to draw it from the original. The men must have been born designers who could thus thread scroll through inscription, interweave line with curve, yet leave the spectator's mind in a condition of pleased repose. However elaborate, there is always a balance and completeness which produce a sense of content. The cursive ornament, even when most intricate, never wearies, never confuses the eye. The due relation of ornament to ground is maintained throughout, with just sufficient accent at intervals to prevent perplexity.

There are some forms of design occurring in Arabic buildings which seem to indicate a special delight in mere ingenuity. The best known are those wonderful combinations of parallel lines radiating from a series of centres—combinations capable of quite indefinite multiplication, and which no doubt originated in the woodwork, which affords most examples. It came, however, to be applied to every sort of material and every sort of surface—even to enrich the spheroid forms of domes, as in the mosque of Kait Bey. I think it would not be difficult to prove that this motive of design really sprang out of the exigencies of the material in which it originated; and that a system of latticed or interlaced construction in wood grew out of the scarcity of large timber, and its tendency to shrink if used in broad planks in the dry heat of Egypt or Syria. The advantages of a latticed framing led to a development of latticed design.

Then there is the system of ornament which in a former Paper * on Arabic art I have called "reversible," from lack of a better name.

This ornament, frequently introduced in parti-coloured stone-work, is so designed that the ground is a reversed counterpart of the pattern—in other words, the same design cut out in black and in white will allow each to fit into the other. This device, sometimes carried out with much elaboration, can be progressively traced from a simple source—the joggled joint of lintel and archivolt which occur in Byzantine work. Its use in Arabic stone-work is most frequently in one of those positions. The same system of interfitting parts, of various colours, but of the same form, is carried out, however, in many different ways, as surface ornament; sometimes with amazing ingenuity.

The use of written inscriptions, as a portion of the ornamentation, may be said to be a special feature of Arabic ornamental decoration. Perhaps it may be held to supply the "living interest" which would otherwise be wanting.

* See TRANSACTIONS, 1869–70, p. 78, on "The Ornamental Features of Arabic Architecture in Egypt and Syria."

The square, set forms of the earlier (Cufic) characters were utilised with admirable effect, not only by themselves in bands, as borders, but associated with graceful scroll-work, to the curves of which they afford an admirable foil. The great frieze in the mosque of Sultan Hasan is, perhaps, the noblest bit of ornamental writing in existence. But whether alone or combined with ornament, whether one of the various forms of "Cufic" or the more modern and cursive "Neskhi," writing is in frequent use as an ornamental or decorative feature. It must be borne in mind, too, that caligraphy is, by the Arabic-speaking peoples, regarded as a fine-art, and is, in fact, the only form of graphic art cultivated by the rich or well-born. Therefore a beautifully written sentence or device calls forth a critical appreciation among the more educated Arabs, such as only imitative pictorial work elicits from us, and having the advantage that it is subject to extremely well-defined canons.

The use of carving, though general in buildings of any pretence, occurs for the most part with considerable reserve, especially in private houses; and, whether in stone or wood, is usually in rather low relief, the surface of the design being crisply worked in a manner which has much similarity to that practised in Byzantine or Romanesque carving, or in that of debased Greek work. The actual outline or form of the ornament is cut straight down to the ground, if the ground is retained, or pierced like fretwork if open. The ornament itself is, of course, entirely conventional as a rule; but I call to mind one instance, at any rate, where the shallow basin of a fountain, cut in the marble pavement of a ka'ah, was encircled by two serpents carved on the edge, and meeting at the channel of exit.

The contrast of light and dark material plays a more important part than carving in many—perhaps most—buildings; and from its simplest use in alternate light and dark courses, to the most elaborate detail of inlaid marble, it seems native to the style. Looked at from a critical standpoint, this use of dark and light courses externally in buildings exposed to the glare of an Egyptian sun has, I think, much in its favour. It serves to explain surface and form, and to avoid monotony in situations where carving would be lost in the dazzling light, and it does this without disturbing the impressive grandeur of the great shadows, which fall with unbroken edge. Arab architecture has well exemplified in many a building the dignity to be derived from large unbroken masses, whether of light or shadow.

As to the use of inlaid ornament in black and white marble, sometimes assisted by red or yellow, there is no obscurity about its history, as a glance at the interior of Justinian's great church at Constantinople must show, but in no decorative feature do we find more purely Arabic detail than in the borders so executed. The glazed tiles which play so important a part in the interior decoration of Arab houses are in origin and design thoroughly Persian, and to a very great extent they were of Persian manufacture, although they were certainly made also at Damascus as late as the latter part of last century. I am inclined to think that most of the very large tiles, about nine inches square, which are frequent in houses both at Cairo and Damascus, were made at Damascus; and that the smaller tiles, which are often also of rather finer

quality, are more usually from Persia, where, indeed, the manufacture is continued to this day.

But the full splendour of decorative treatment is to be looked for in the timber ceilings of the mandàarah and ka'ah. Some of these present a glory of gold and colour which, until seen, seem hardly compatible with the simple scale of colouring in the lower walls: for the lower part of the wall, where marble has been used, is practically black and white; the upper wall, in that case, being probably of the blue and green tiles. Or, in the absence of marble, the tiles may occupy the lower storey, and the wall between that and the roof be either plain white, or white banded with black, in imitation of alternate courses. Yet it is where this simplicity begins to merge into shadow that the rich glow of colour begins. Starting, perhaps, with some richly-coloured band of ornament at the bottom, a frieze, or coving, ornamented probably with writing, forms a cornice to the ceiling or roof. This may be flat, and divided into geometric forms by a mere bead or fillet of wood; or it may be one of the beam and panel ceilings accurately described in Count d'Hulst's Paper. Certainly never was obvious simplicity of construction mated more perfectly with elaboration of surface ornament than in these admirable ceilings. With some variation of detail and colouring, they occur and recur in many Cairo buildings. For richness of decorative effect I know nothing to surpass them. The large beams, rounded or octagonal in section on their lower faces, are frequently enriched by low relief ornament worked in a sort of "gesso" on their surface, and gilt. A major and a minor ornament entwine and interlace with a grace and ingenuity which seem unrivalled outside Arabic art, and with a varied elaboration that drives the most able draughtsman to something like despair. The perfect balance and elegance of these entirely conventional convolutions are indeed surprising in all the Arabic ornamentation, which ought to occupy a prominent place in any curriculum for students in design.

But if the splendour of the roof seems, at first, hardly consistent with the cool and quiet colouring of the walls, we must not forget that these apartments are incomplete without their accessories. There are still to be taken into account the rich colours of the carpets, of the divan coverings, and perhaps it is fair to include also the habitual costumes of the occupants: not the black and white of European dress, but the rich and varied colouring of the native costume. A street in Cairo is a kaleidoscope of colour, owing to the ever-varying hues of the passing crowd: and no less varied are the colours worn by that section of the crowd which is represented by the occupants of the reception-rooms of a large Cairo house.

With the harmonious glow of colours of the Persian or Smyrna carpets, which are still used in such houses, we are familiar; and we know, too, that similar carpets made two or three hundred years ago were, to say the least, not inferior in colouring to any that can now be procured. If then we picture to ourselves these apartments as they appeared when occupied by the men who erected them, we have before us interiors which for beauty and fitness it would, indeed, be difficult to surpass. Even now, with frequently incongruous changes, sometimes with the squalor of neglect,

they affect the imagination, and excite admiration to an extent which it is hard to measure.

Whence came all this refined art; this architecture, perfectly adapted to the people, their manners, life, religion, country: its accessories all fitted to, and grown with, the architecture; its ornamentation so admirably consistent with the whole? Is the plan of the house Roman? No doubt it has many late Roman features; but is not this due rather to a common parentage than to any other cause? There can be no doubt that the habits and manners of the later empire were greatly influenced by the East. An older empire than that of Rome had developed a civilisation and love of luxury from which Rome and Byzantium had borrowed more and more. Does not the art which seems to have sprung into life with the Mohammedan conquest owe its existence and perfection to the confluence of two streams, one from Byzantium and one from Persia? I think the more it is examined the more this art, which followed on the footsteps of an uncultivated horde of fanatics, will be found to be mainly due to these two sources; though how blended into one so exquisite whole it may now defy man's ingenuity to discover.—J. D. CRACE.

*** The Discussion [see verbatim report in *The R.I.B.A. Journal*, Vol. VI., pp. 356–357] of Count d'Hulst's Paper,* which was supplemented by the Notes of Mr. R. Phené Spiers, F.S.A. [pp. 228–237 *ante*], was opened by Mr. J. D. Crace, whose remarks have been superseded by the Notes since made by him [pp. 237–241 *ante*]; and continued by Mr. Boulnois, Mr. Carpenter, F.S.A., and Mr. Brindley, F.G.S. A brief abstract of their remarks is here appended:—

Mr. W. A. BOULNOIS, *Fellow*, referred to the exportation from Cairo of entire rooms and their fittings, which used to take place some few years ago, for the purpose of re-erection in European cities.

Mr. R. HERBERT CARPENTER, F.S.A., *Fellow*, stated, in reply, that the desecrated mosque of El Hakeem had been converted into a museum of wood and metal-work, tiles, mosaics, &c.; and that an immense amount of valuable work of the kind, which had been collected, was there preserved. In 1876, when in Cairo, he had a whole house-front offered to him at a very cheap rate, but at the present time it was not easy to get such antiquities out of the country.

Mr. W. BRINDLEY, F.G.S., said that he failed to perceive much difference between the Arab houses of Cairo and those of Tunis and Algiers, or of Spain. At Granada, in the upper part of the

* Count d'Hulst's Paper was profusely illustrated by photographs, made by himself, of the following buildings in Egypt, viz.:—

Alexandria—(1, 2, 3), Mosque portals; (4) Mosque; (5) Portal, and (6) Seebeel of No. 4. Assiout—(7, 8, 9), Mosque portals; (10, 11), Portals of Okallahs. Damietta—(12), Mosque portal; (13), Seebeel; (14, 15), Doors; (16), Entrance to the Great Mosque outside Damietta, and (17), Court of same; (18), Minaret; (19, 20, 21), Houses. Mansurah—(22), Mosque portal; (23), House door. Mehalla-Kebir—(24), Entrance to bath; (25), Entrance to a large house, and (26), Court of same; (27), Okalla; (28, 29, 30, 31), Mosque portals. Menzaleh—(32), Portal of tomb; (33), House; (34), Tomb of a Saint; (35, 36), Exterior of a house, and (37, 38), Interior of same; (39), Mosque portal at Mizaned, near Menzaleh. Rosetta—(40, 41), Street, and (42), Upper part of some houses in same; (43), Another street; (44, 45, 46), Houses; (47), Mosque portal; (48, 49), House; (50), Tomb of a Saint; (51), Street, with entrance to an Okalla, and (52), Interior of same; (53), Entrance to an Okalla; (54, 55), Mosque of Ramanieh, near Rosetta. Samanoud—(56, 57), Mosque portals.

town, there were still existing small houses almost intact as they were left by the Moors; and at Seville most of the large modern houses of well-to-do people were built on the Moorish plan. He had seen and examined, only last year, in the so-called House of the Mufti at Cairo, the mosaics, which were in good preservation, and in his opinion they must have originally belonged to one of the churches of Constantine or Justinian. The Arabs, no doubt, adapted them to their present use and position, adding merely the white bands.

LXXIV.

ST. STEPHEN'S, WALBROOK. By FRANCIS C. PENROSE, M.A. Cantab., *Past Vice-President* (*Royal Gold Medallist*).

[Additional Paper, not read at a Sessional Meeting.]

THE account of this church in Wren's *Parentalia* is as follows:—"*St. Stephens* "*Wallbrook* church near *Stocks Markets* was rebuilt in 1676. The walls and "Tower are of stone—the roof within over the middle-aile is arched. In "the center of the church is a spacious cupola and a lantern in the middle of that. "Over the rest of the church the roof is flat supported by Corinthian columns and "pilasters. There are three ailes and a cross-aile. The length is 75, breadth 56, "altitude of the middle roof 34, of the cupola and lantern 58 feet, and of the Tower to "the top of the rail and Banister about 70 feet." The cost of rebuilding the church is stated to have been £7,652. 13*s*. 8*d*.

It should be observed that the dimensions given above are incorrect, and they have been so quoted in several subsequent accounts, amongst which may be named Elmes's *History of Sir Christopher Wren*; but the dimensions are accurately given by Clayton, and also in the diagrams which follow [figs. 117, 118].*

In describing this church Fergusson praised the interior as the most pleasing "of "any Renaissance church which has yet been erected;" and it has often been spoken of as Sir Christopher Wren's masterpiece. If the comparison be restricted to his executed works, I for one agree to this estimation of it. The one exception which it seems to me ought to be made is the design for St. Paul's, of which he has left a model, but was not permitted to carry out. As in this design his subject was so much greater and the triumph of his genius not less complete, the palm may very properly be reserved for it, but without any disparagement to the perfection of his treatment of St. Stephen's. Of this church it may safely be said that in no other building has so much been made of a plain oblong space and sixteen columns. The secret lies entirely

* *The Works of Sir Christopher Wren*, by John Clayton. Fo. Longman, 1849.

in the arrangement of the plan and the harmony of the proportions; for the decorative details, although not inappropriate, are far from being of first-rate excellence. They

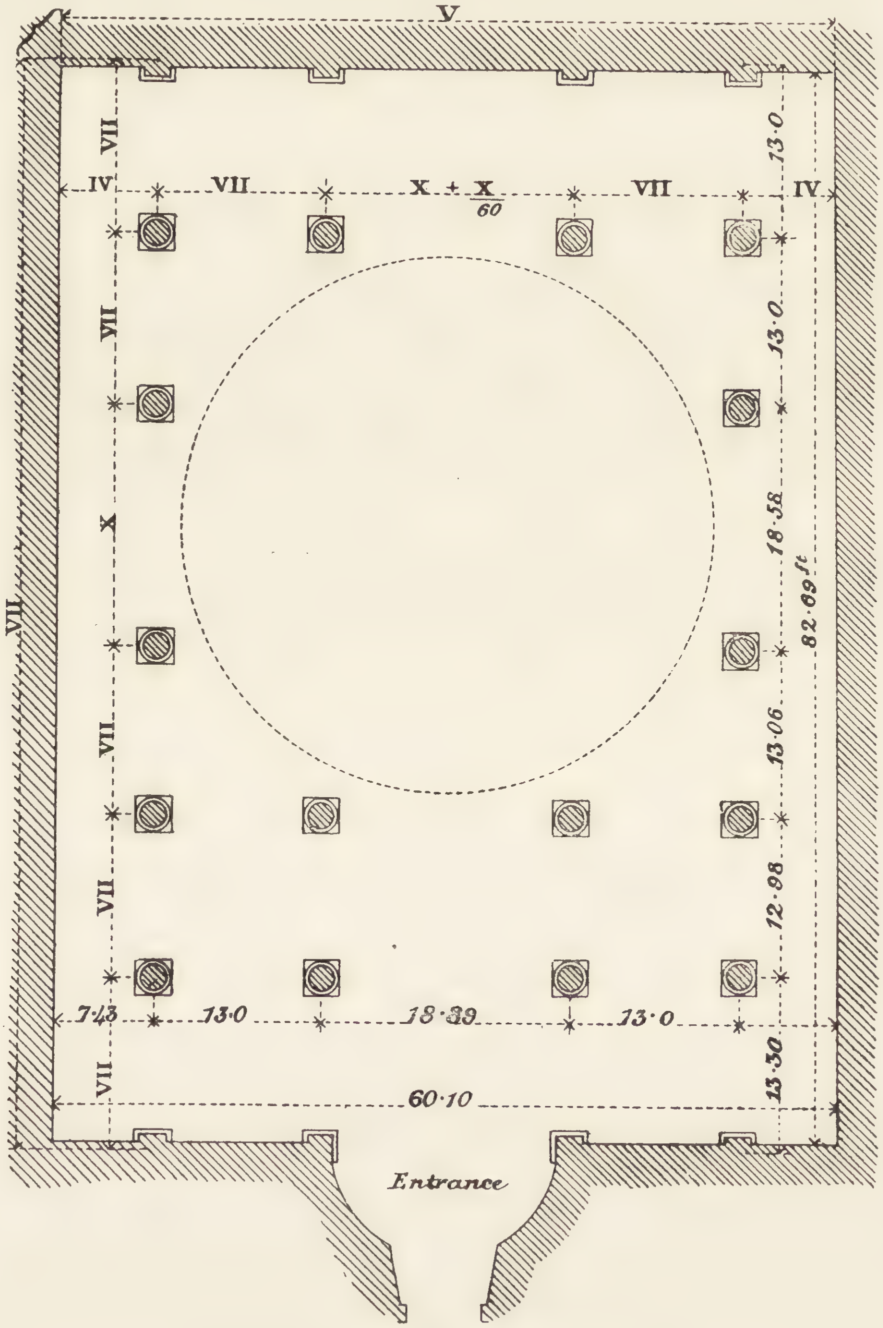
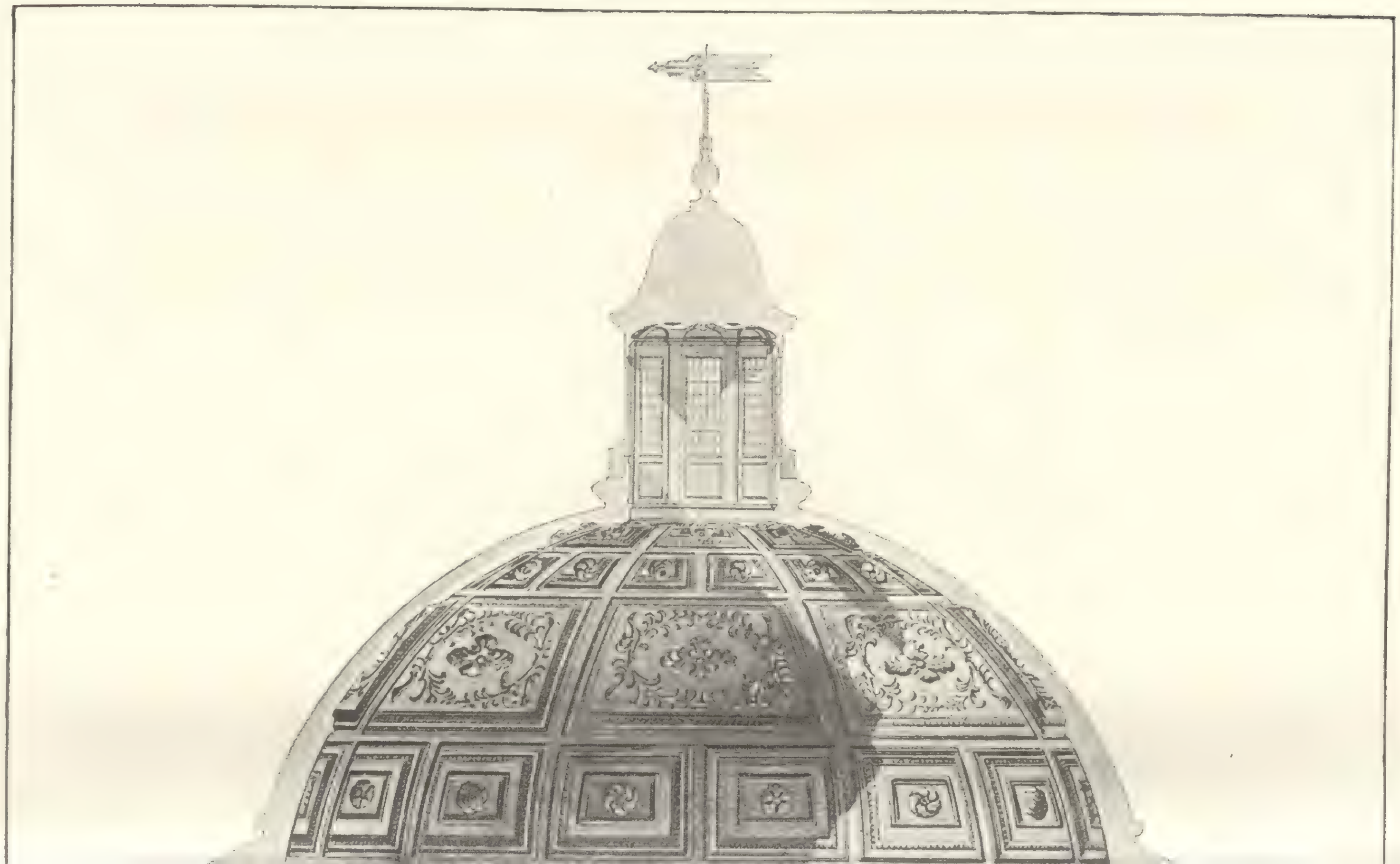


Fig. 117.—Plan of St. Stephen's, Walbrook.

are not more elegant than those of several others of the City churches, and are certainly in this respect inferior to the ornamental work in the Cathedral.

LXXIV. ST. STEPHEN'S, WALBROOK (xl)

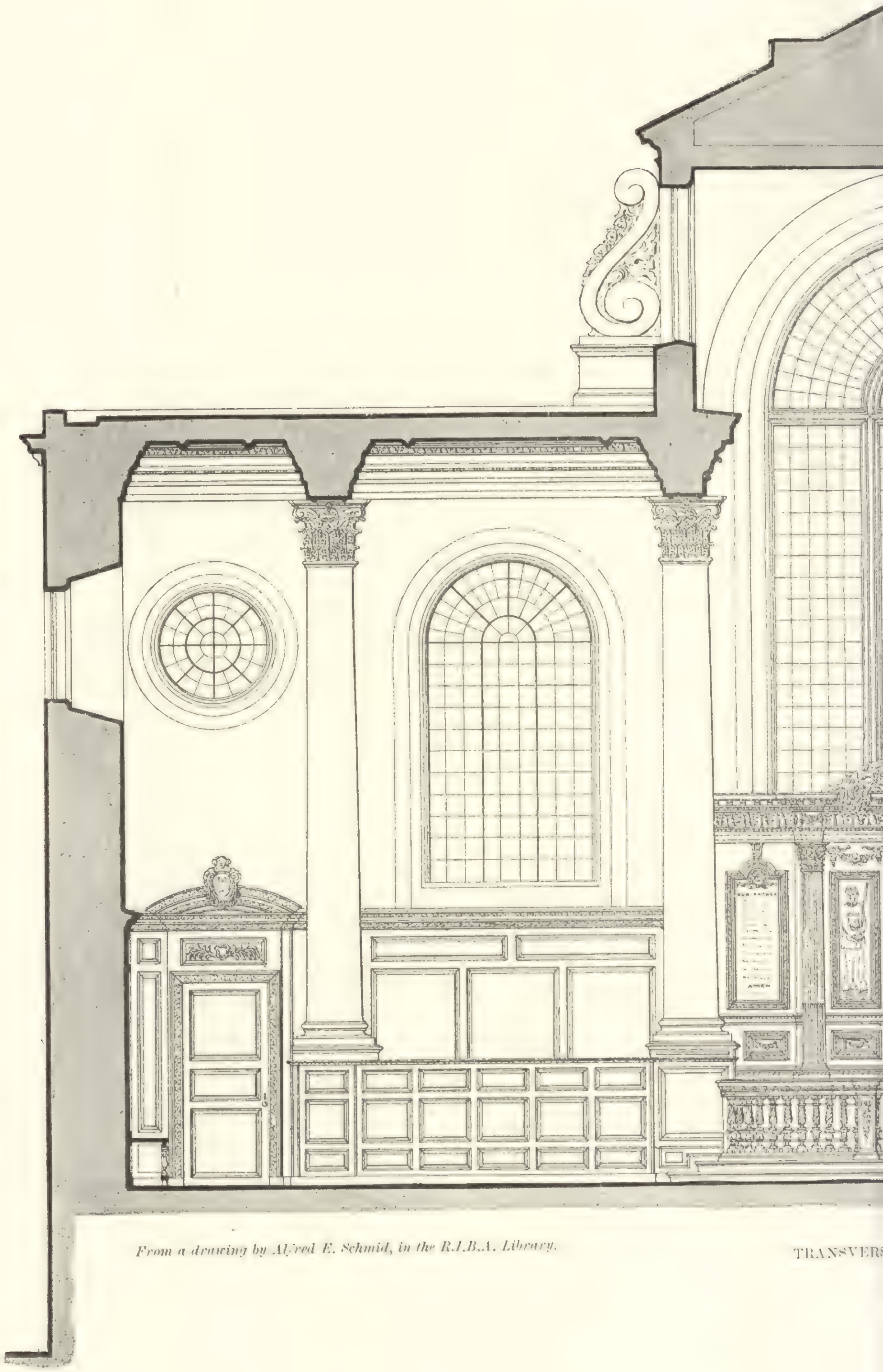


From a drawing in the R.I.B.A. Library.

TRANSVERSE SECTION THROUGH THE CENTRE OF THE DOME, LOOKING EAST, PRIOR TO 1850.

[See page 249.]

LXXIV. ST. STE



From a drawing by Alfred E. Schmid, in the R.I.B.A. Library.

TRANSVERS

N'S, WALBROOK (xii).

TION: EAST END. 1847–48.

ges 249, 252.]

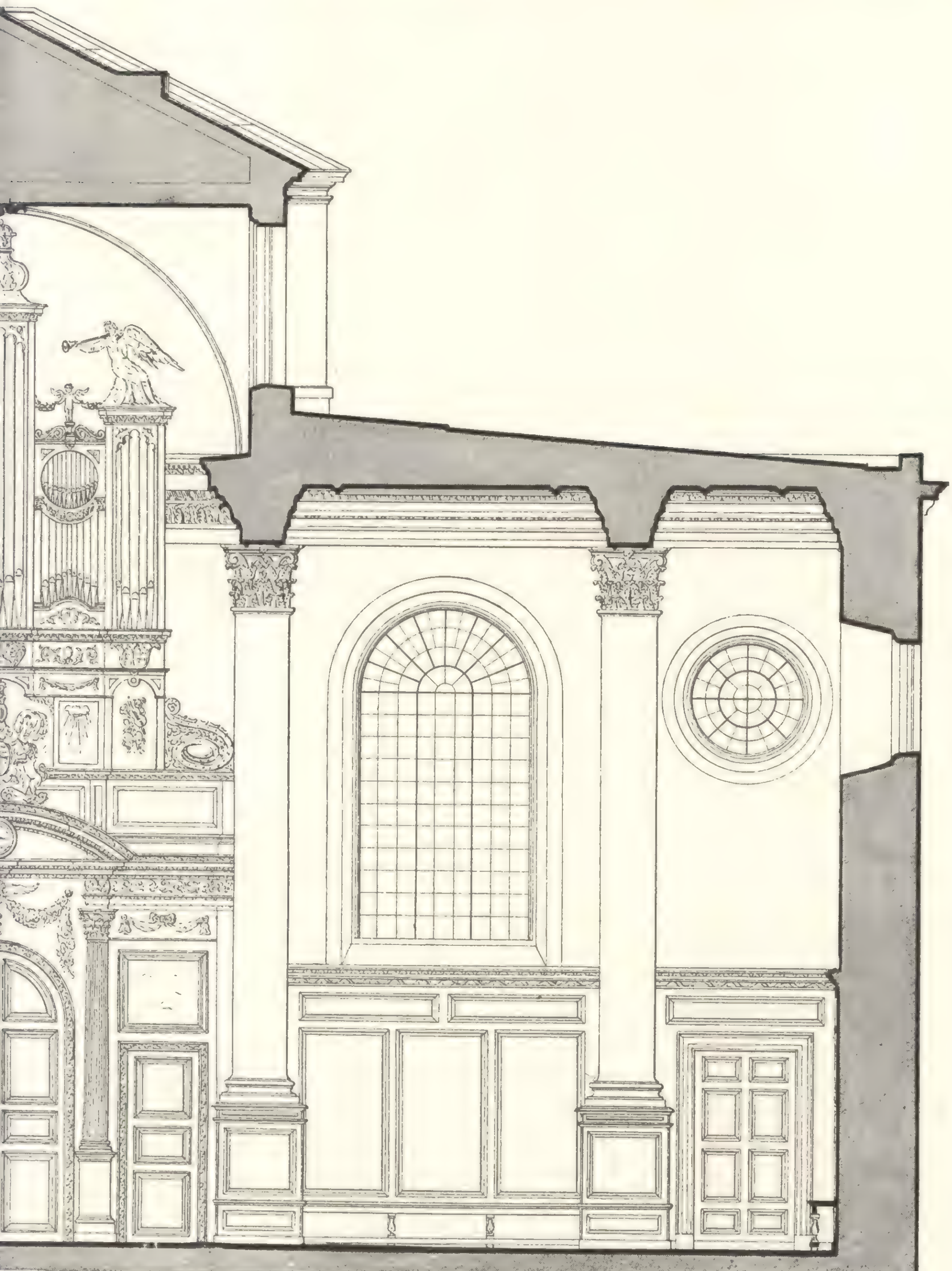
LXXIV. ST STEP

From a drawing by Alfred E. Schmid, in the R.I.B.A. Library

TRANSVERSE SEC

[S

NS WALBROOK (X.II)



N: WEST END, 1847–48.

ge 240.]

Among the beauties of the plan we may notice the extreme lightness of the structure, the proportion of the columnar supports being scarcely more than one hundredth part of the area; also the unencumbered space available for divine service under the cupola, and the happy and natural growth of the pendentives and cupola from the square substructure.

Although it may not be so absolutely demonstrable in architecture as it is in music, that commensurability of adjacent parts in a scale of low numbers is a necessary element of perfection, it at least rises to a very high degree of probability that it is so; and that this quality prevails in this work of Sir Christopher Wren will be seen from the accompanying diagrams. In fig. 117 are given the horizontal and in fig. 118 the vertical proportions. In these diagrams the dimensions are given in Arabic and the proportions in Roman numerals.*

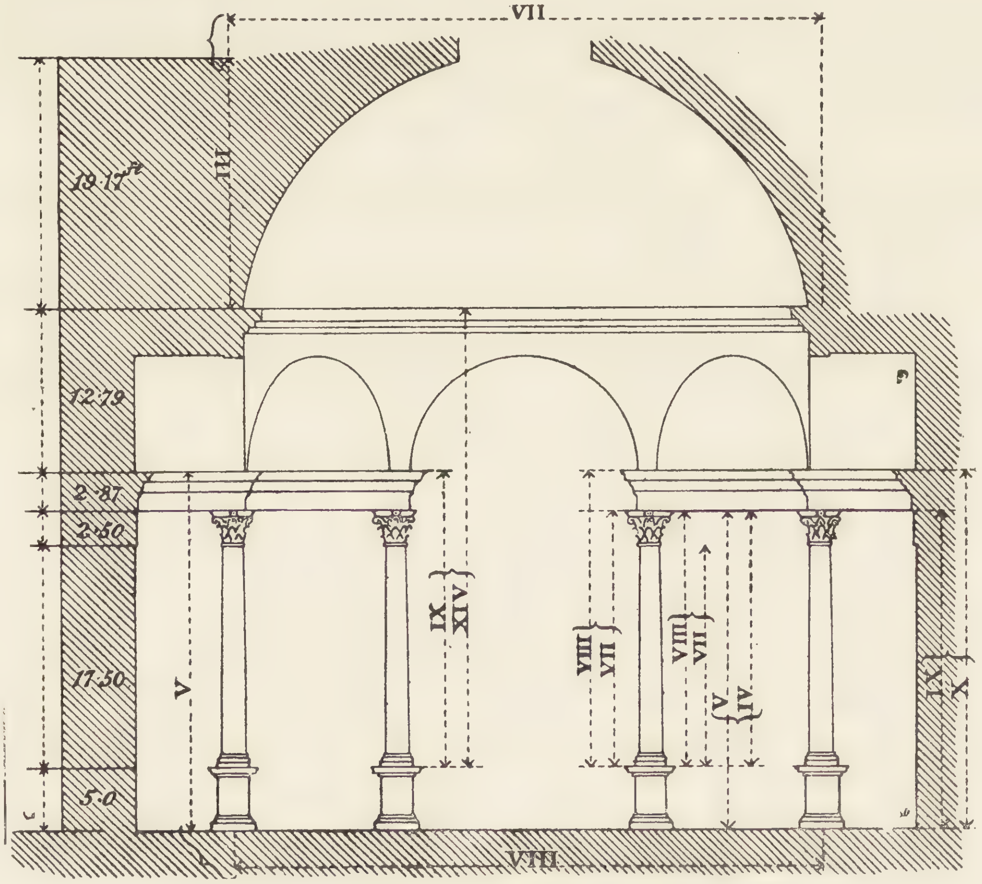


Fig. 118.—Transverse Section through the Centre of the Dome.
See also Illustn. xl.

* Illustn. xl, showing West's picture which was removed in 1850, and being also a transverse section through the centre of the dome, is a reproduction of the drawing (now exceedingly worn and discoloured) presented to the Architectural Society by William Grellier, January 23, 1836. Illustns. xli and xlii are reproductions of drawings which form part of the bequest made by John Turner, recently deceased, who was a member of the old Society, but one who did not join the Institute when that Society was merged therein.

The proportions shown on these diagrams agree with the measurements with such great exactness that it is impossible to doubt the intention. For instance, *in the Plan,* we find—

		Error in terms of the denominator.
The general proportion of internal breadth to the length	5 to 7	·0026
The ordinary to the wider columniation . .	7 to 10	·0005

In the Section we find,—

The height of the Order including the pedestal compared with the *basic* proportion of breadth, measuring 24 units, or $\frac{15}{7}$ of the ordinary columniation which contains 7 such units . .	5 to 8	·0005
The entablature compared with the height of the Order as above	1 to 10	·0031
The height of the column compared with that of the Order exclusive of the pedestal . . .	7 to 8	·0005
The height of the attic compared with that of the Order exclusive of the pedestal . . .	5 to 9	·0027
The height of the cupola measured from the top of the cornice to the *basic* breadth . .	3 to 7	·0015

It will be observed that the number 7 occurs rather frequently in the numerator or denominator of the ratios which measure these proportions, viz:—

The general proportion of the plan . . .	7 : 5
The ordinary to the wider columniation . . .	10 : 7
The height of the Order including the pedestal to the ordinary columniation	15 : 7
The height, internal, of the cupola to the *basic* breadth .	3 : 7
The height of the column to that of the Order—that is, exclusive of the pedestal	7 : 8

I find that, in St. Paul's Cathedral, Sir Christopher Wren used this number 7 as one of the terms of his proportions in a great many instances. For instance, in the relation which prevails amongst the heights of many of the different columns or pilasters employed,—

Interior.

The column of the principal Order, 40 feet, being taken as base of the proportion:

The dome pilasters $\frac{2}{5}$ principal Order.
Impost of the arches of the ground storey $\}$ $\frac{3}{5}$ principal Order.

Exterior.

The column of the principal Order, 40 feet, being taken as base of the proportion:

Peristyle of dome $\frac{7}{8}$ principal Order.
Upper Order $\frac{13}{14}$ of dome peristyle.
Dome impost $\frac{4}{7}$ dome peristyle.

Interior (*continued*).

Screen of choir . $\frac{7}{15}$ impost Order.
Consistory Court and North Chapel . $\frac{7}{18}$ impost Order.
Bishop's throne . $\frac{7}{20}$ impost Order.

Exterior (*continued*).

Dome lantern $\frac{7}{9}$ dome impost.
Western towers $\frac{9}{14}$ upper Order.
Library and trophy room windows $\frac{1}{2}$ upper Order.
North and south doors $\frac{4}{9}$ principal Order.
West side doors $\frac{2}{7}$ principal Order.

It is certainly interesting to find in St. Stephen's, Walbrook, so many accurate proportions in terms of low numbers. Sir Christopher Wren was not, however, a slave to these numbers, and did not hesitate to depart slightly from the exact rule when a sufficient reason presented itself for so doing; and we find that whilst the ratio between the ordinary and the wider columniation prevails with extraordinary exactness in the line parallel to the longitudinal axis, the central transverse openings are made about three inches wider so as to give a wider opening where it would be advantageous.

Notice should also be taken of this point—viz. that, although the arrangement of the columns under the cupola is apparently octagonal, the proportion between the openings is as the numbers 7 to 10, and not as 7 to 9·8992, which would have made the octagon exact. The former proportion seems to have been preferred on account of the closer harmony of the numbers.

The Rector and Churchwardens had for some years past been considering the propriety of making extensive alterations in the interior of the church, and were considering how best to bring it back to the state they had reason to believe was Sir Christopher Wren's original idea. At the same time they wished to render it more suitable to the existing congregational requirements than it would have been had the interior remained closely crowded with the pews with which it was filled in the seventeenth century. This proposal was brought to a practical head by the discovery of a widespread attack of dry-rot, by which not only the floor was affected, but the foundation of the pulpit and the pews. This work was finally taken in hand in 1887, under the superintendence of the present City Architect, Mr. Peebles. Under his direction the original pews were removed, and square pedestals substituted for those of octagonal plan which had previously supported the columns. The decayed floor was replaced by concrete and covered with mosaic tesseræ. The general scheme, but not the detail of the seats, had also been settled by the Rector and Churchwardens, when the appointment of Mr. Peebles to the office of City Architect led to his resignation, and to the continuation of the works being entrusted to me. I had on several occasions been invited to consultations in the Vestry, and had entirely supported the proposal that as the pews were to be removed the pedestals should be altered. The works which remained for me to do consisted chiefly in the design of the seats and the rearrangement of the pulpit.

The following arguments appear to me to warrant the alteration made to the

pedestals. Those of octagonal shape were, no doubt, built in Sir Christopher Wren's time; it is, however, abundantly clear that it was not from architectural preference, but on account of their economy of space, that they were adopted, and that when the ordinary congregation was reduced, by the alteration of city life, to 20 per cent. at the most of the original number, their *raison d'être* had ceased to exist.

In the vestry of the church is preserved an engraving which shows the columns supported on square pedestals. It is true that this representation is not contemporary with Sir Christopher Wren, for its date is 1746, and is dedicated to Sir Christopher Wren's son, but from this very circumstance it may be argued that it shows the church in the state in which the architect would have preferred to have left it had this been possible. The dedication of the engraving is as follows:—

"To Christopher Wren esq.

"This inside view of one of the noble Proofs of his father's superior genius is "humbly dedicated by his most obedient servant Samuel Wall.

"Published according to Act of Parliament, Oct. 22, 1746. Pr. 5*s*."

In a copy of the *Parentalia* preserved in the Cathedral Library is another engraving of this church, dated 1750, showing the square pedestals; the engraving bears the following subscription:—

"Thos. Boydell, delin. John Boydell, Sc.

"Published at the Globe, Durham yard, in the Strand, London, 1750."

There is also another noticeable circumstance connected with this point derived from the Vestry Minute Book, dated 31st May 1678. The following Resolution occurs therein:—"Ordered that the church be forthwith pewed. That in order thereto the "Church Wardens with Mr. John Brissod, Mr. John Pollexfen, Mr. David Brown, "Mr. Henry Griffith, Mr. Adrian Quyney, or any two of them together with the "churchwardens and any two of the parish of St. Bennett Sheerhog as they shall "appoint, shall treat with fit workmen and give in their proposals to the next vestry, "that it may be agreed by the vestry to have the works done, the moddell for the work "in scantlings and workmanship to be like St. Nicholas Cole Abbey." It may fairly be argued from this that Sir Christopher Wren had deferred, until the very last moment, the arrangement of the pews, in the hope that it might have been found practicable to retain this exquisite gem of architecture as little encumbered as possible—in fact, as it is now seen.

It is to be regretted that in the recent alterations it appeared impracticable to restore the windows into harmony with the rest of the design, by removing some of the painted glass with which they were filled several years ago. All that could be done in this direction was the replacing a part of Sir Christopher Wren's "Altarpiece" [Illustn. xli], which had been taken down and which now hides a small portion of the incongruous east window.

F. C. PENROSE.

LXXV.

A NOTICE OF THE LATE MR. PULLAN, F.S.A., *Fellow.*

By Professor Aitchison, A.R.A., *Vice-President.*

[Additional Paper, not read at a Sessional Meeting.]

RICHARD POPPLEWELL PULLAN (1825–1888), architect and archæologist, was born at Knaresborough, in Yorkshire, 27th March 1825. He was the son of Samuel Popplewell Pullan, solicitor, of that town. He was educated at Christ's Hospital, and became a Grecian before leaving. He and Mr. Alfred Waterhouse, R.A., were fellow-pupils of the late R. Lane, architect and surveyor, of Manchester, who was highly respected.

Pullan was an earnest student of the old Missals and illuminated MSS. in Cheetham's College. He became an early convert to Mediævalism; and, having a passion for heraldry, amused himself with emblazoning pedigrees, some of which, emblazoned in colour, were said to be quite works of art. In 1844, when he was not more than nineteen years of age, he sent in a design for the robing-room of Her Majesty the Queen at the House of Lords, which attracted notice from its richness of colour, though he was considered too young to carry it out; subsequently he was engaged in making designs for stained glass, and never relinquished his study and practice of polychromy. He then visited Italy, and mainly devoted his attention to church architecture. He assisted Sir Digby Wyatt in the polychromy of the Byzantine and Mediæval Courts of the Crystal Palace, opened by the Queen on 10th June 1854. On 5th October 1853 the Sultan declared war against Russia, and on 17th October 1854 Sebastopol was besieged. Pullan went there during the siege, and made sketches and models of the contours of the district. On his return from the Crimea, his model of the country about Sebastopol, showing the fortifications, was exhibited.

He took an office in Cork Street, Burlington Gardens, London, and while there sent in two designs for the Memorial Church at Constantinople. In 1856, in conjunction with Mr. Evans, he sent in a competition design for Lille Cathedral, and they obtained a silver medal. In the same year, Mr. Newton (now Sir Charles) was

entrusted with the task of discovering and excavating the site of the Mausoleum at Halicarnassus. The sculptures and fragments that were found on its site are now exhibited in the Mausoleum Room at the British Museum. After the site had been excavated and partly filled in again, Pullan was appointed by the Foreign Office architect to the expedition, on the recommendation of the Trustees of the British Museum, and arrived at Budrum on 25th August 1857; he had not only to measure the architectural remains, but to make a restoration of the Mausoleum in accordance with the descriptions of Pliny the Elder, Hyginus, and Guichard—and one that would agree with the remains. He displayed great ingenuity in showing a construction of the pyramid that admitted of the stone trabeation beneath it, between the peristyle and the central structure of the Pteron.

Nicolas Galloni, a Greek, from the island of Calymnos, told Mr. Newton that there was a much bigger lion at Cnidos than any of those found in the walls of Budrum and on the site of the Mausoleum. Pullan was sent there to find it, and he discovered it, not in the Tropium promontory, but on a headland to the west of the bay. It was lying in a pool of water, which Pullan drained. He then made a road by which the lion was conveyed to the shore, and was with great difficulty got on board the vessel which conveyed it to England. It was ten feet long, six feet high, and weighed, with its case, eleven tons. It is now in the Elgin Room in the British Museum. He made a restoration of the tomb which the lion crowned from the fragments discovered, and afterwards made a survey of the principal sites in the island of Cos, and made drawings of the remains. All these restorations are published in "*A History of* "*Discoveries at Halicarnassus, Cnidus, and Branchidæ*, by C. T. Newton, M.A., assisted "by R. P. Pullan. London 1862–63." He was then employed by the Society of Dilettanti to excavate the sites of the Temples of Bacchus at Teos, of Minerva Polias at Priene, and of Apollo Smintheus at Chrysa—all temples of the Ionic Order; and for this purpose he chose Smyrna as his headquarters.

In April 1862 he began the excavations on the site of the Temple of Bacchus at Teos. In the first publication of the *Ionian Antiquities* by the Society of Dilettanti, a restoration of the temple according to Vitruvius was given, with illustrations of the parts of the Order found; but in the subsequent volume, of 1821, the restoration was omitted, as it was merely imaginary. Pullan found the temple to be hexastyle, as described by Vitruvius [lib. 3, cap. 3, p. 8], and with eleven columns on the flanks, but not pseudodipteral, and consequently not the one built by Hermogenes; and in Pullan's opinion it was erected in Roman times. His restoration was published in the fourth part of the *Antiquities of Ionia* in 1881.

The remains of the Temple of Apollo Smintheus, or Apollo the Mouse-queller, near Kulakli, in the Troad, were first discovered by Lieutenant Spratt in 1853. Apollo is said to have delivered the people of Chrysa from a plague of mice; their bow-strings and shield-straps were gnawed so by the mice that their bows and shields could not be used. A statue of the god carved by Scopas had a mouse beneath its foot [Strabo lib. 13, cap. 1, par. 48].

Pullan left Smyrna on 5th August 1866, and went to the site of the temple near Kulakli, having visited the ruins four years before. He completed the excavation and sketches on 22nd November of the same year. Sufficient remains were found to show that it was an octastyle pseudodipteral temple, with only fourteen columns on the flank, and to get the details of the Order. It is a good specimen, rather superior to that of Minerva Polias at Priene, and probably of about the same date. His drawings were published by the Society of Dilettanti in the fourth part of the *Antiquities of Ionia*, in 1881.

In 1812 Sir W. Gell, J. P. Gandy, and F. Bedford visited the Temple of Minerva Polias at Priene, mentioned by Pausanias [lib. 7, cap. 5], dedicated by Alexander the Great, and said by Vitruvius to be built by Pytheus [Vit., lib. 1, cap. 1, p. 12]. It was formerly on the shore of the Latmic Gulf, but is now several miles inland, Bedford's plan showing it to be a hexastyle temple with eleven columns on the flanks. A restored front elevation, as well as the details, were published in the *Antiquities of Ionia*, by the Society of Dilettanti, in 1821. In 1861 Pullan visited it, and in 1869 he had an order from the Society to excavate the site, which had hitherto been encumbered with ruins; and the plan as well as some of the details were found to differ considerably from those published in 1821—the base that Bedford drew being only partly worked. Pullan also gave sections, to a large scale, of the base, and of other mouldings found in the temenos; this work was also published in the fourth part of the *Antiquities of Ionia*, in 1881.*

Besides making all these antiquarian researches, illustrations, and restorations, Pullan competed for the Memorial Church at St. Petersburg, Truro Cathedral, the War and Foreign Offices, the Liverpool Exchange Buildings, the Natural History Museum, the Glasgow Municipal Buildings, the Dublin Museum, and the Hamburg

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* The following is a complete list of the published works of the late Mr. Pullan, and of those in which he largely assisted:—

- A History of the Discoveries at Halicarnassus, Cnidus, and Branchidæ. By C. T. Newton, M.A., assisted by R. P. Pullan. Text 8vo., plates fo. Lond. 1862–63.
- Byzantine Architecture. By C. Texier and R. P. Pullan. Fo. Lond. 1864.
- Principal Ruins of Asia Minor. By C. Texier and R. P. Pullan. Fo. Lond. 1865.
- The Altar, its Baldachin and Reredos. Pamph. 8vo. Lond. 1873.
- Catalogue of Views illustrative of Expeditions to Asia Minor. Pamph. 8vo. Lond. 1876.
- Remarks on Church Decoration. 8vo. Lond. 1878.
- Eastern Cities and Italian Towns. 8vo. Lond. 1879.
- Elementary Lectures on Christian Architecture. 8vo. Lond. 1879.
- Antiquities of Ionia. By the Society of Dilettanti. Part the fourth. Fo. Lond. 1881. (Wholly illustrated by Pullan, with the exception of 3 plates of Priene by Mr. E. Falkener.)
- Studies in Architectural Style. Fo. Lond. 1883.
- Architectural Designs of W. Burges. Fo. Lond. 1883.
- The House of W. Burges, A.R.A. Edited by R. P. Pullan. Fo. Lond. 1886.
- Architectural Designs of W. Burges. 2nd series. Fo. Lond. 1887.
- Studies in Cathedral Design. Fo. Lond. 1888.
- Papers read at the Royal Institute of British Architects:—
  - Classic Art, 24th May 1871.
  - Decoration of Basilicas and Byzantine Churches, 15th Nov. 1875.
  - Works of the late W. Burges, 17th April 1882.
  - Decoration of the Dome of St. Paul's Cathedral, 4th Dec. 1882.

Town Hall, besides competing for the Church at Constantinople and for Lille Cathedral before mentioned. He prepared drawings for the restoration of the parish church at Hawarden, but during his absence with the Budrum Expedition the church was burnt down, and rebuilt by the late Sir G. Gilbert Scott, R.A.

His principal executed works were churches at Pontresina and Baveno; and the conversion of Castel Aleggio, between Lago Maggiore and Lago d'Orta, into an English Gothic mansion.

The church at Baveno is octagonal in plan and of the Lombard type, built for Mr. Henfrey in the grounds of his villa. Mr. Henfrey lent this villa to Her Majesty the Queen during her stay on the Lago Maggiore in 1882. The whole of the coloured decoration was designed by Pullan, and much of it was executed with his own hand; a view of it was exhibited at the Royal Academy in 1882.

On the death of William Burges, A.R.A., 20th April 1881, Pullan completed all Burges's works left unfinished. He also advised Lord Savile, then British Ambassador at Rome, to excavate at his property at Civita Lavinia, on the Alban Hills (Lanuvium). The results of these excavations have been to discover the ruins of the Imperial villa of Antoninus Pius, where Marcus Aurelius was brought up, and to find several magnificent fragments of sculpture, as well as some archaic terra-cottas, possibly belonging to the Temple of Juno Sospita mentioned by Livy. In addition to this, Pullan published, or assisted in the publication, of many works on Architecture, a list of which is printed on the preceding page.

Besides the example of energy and indefatigable industry he has given to the profession, I may mention one peculiar debt of gratitude we owe him. He had visited most of the Byzantine churches in Greece and Asia Minor, and knew the treasures of Byzantine work that had been accumulated by Charles Texier,* and prevailed on that architectural veteran to let him publish a collection of these, embodying in the text his own personal observations with Texier's notes. To give to the world, and to English students in particular, information on this subject which would have otherwise been lost, appears to me to put us all under a great obligation to Pullan; and I think we ought not to let this good deed perish without recording our gratitude, which will, at least, be gratifying to those who were dear to him The following abstract of his Preface to *Byzantine Architecture* is interesting:—

> It was known in the archæological world that M. Texier had many interesting documents on Byzantine art, the fruits of those travels in the East which gained him a world-wide reputation. Antiquaries from Russia, from Germany, and from England, visited Paris to consult these documents. The regret that such valuable information should only be accessible to a few was mentioned to him. He consequently determined to publish a volume on Byzantine Architecture, and

* The ate Charles Texier, a French architect and archæologist of eminence, was an Honorary Corresponding Member, and received the Royal Gold Medal in 1867. His works on Asia Minor, Persia, Mesopotamia, &c. (published 839-52), are in the Library, to which he also presented a large number of miscellaneous Papers in MS.—notes and illustrations of Constantinople in particular—of exceeding interest. He died in 1870.

confided some of these documents to me, with full permission to add information of my own and to condense what was superfluous. I had made three journeys in the East, between 1854 and 1862, and had visited Thessalonica to study the Byzantine remains there, so that I was in some degree qualified for the task. As my share in the work went beyond that of an editor, M. Texier required that my name should be associated with his as joint author, though the principal part of the book is due to his labours and researches.

We have worked together in the hopes of rendering this work worthy of the attention of the literary public. We trust, too, that it will help to fill up a gap that exists in the history of early Christian art. We believe that its perusal will modify certain notions regarding Byzantine Architecture. Some authors affirm that there was a school of Byzantine painting, but not of architecture: we have endeavoured to show that a school of Architecture existed. Others assert that Gothic is the only veritable Christian Architecture; we shall prove that Christianity did not last for twelve centuries without having discovered a monumental form of expression.

In the chapter relating to the conversion of pagan temples into churches, we have given a series of monuments of all periods and of all countries, tending to show that the hatred which Christians were supposed to entertain for pagan buildings was not so violent as it had been represented. Many Greek and Roman buildings which adorn modern towns owe their preservation either to Christian love of art, or to their adaptation to Christian purposes.

We leave our readers to determine how far the study of the churches of Thessalonica, Trebizond, and of the towns in the south of Asia Minor, throws light upon the progress of early Christian art: we believe that it will, at least, enable them to understand the various phases through which Ecclesiastical Architecture passed between the time of Constantine and the end of the Byzantine Empire.

Among many other admirable remarks in his works, I venture to give you the following extracts from his (1) *Principal Ruins of Asia Minor*, and from (2) *Studies in Architectural Style*:—

(1) If our future architecture is to be based upon the laws of proportion, every carefully drawn and measured example of pure Greek or Græco-Roman architecture will become valuable for the purpose of study.

(2) It is an easy matter to make an elevation to suit an irregular plan, to put picturesque doors and windows here, there, and everywhere, without regard to symmetry; but it is a most difficult task to design a symmetrical elevation to suit a convenient plan. Symmetry is, as a rule, scouted by most architects of the Gothic school in favour of the picturesque; yet almost all the larger public buildings of the Middle Ages were, to a certain extent, symmetrical. Such are the Town Halls of Brussels, Ypres, and Louvain. Thus, the studied irregularity of

many of our large Gothic public buildings is a defect instead of a merit, a mark of inferiority instead of ability, on the part of the designer.

(2) As to proportion, Viollet-le-Duc, the most profound student of Gothic buildings, has proved that all the chief cathedrals and churches of mediæval times were designed upon certain principles of proportion, indicated by triangles [see the article on "Proportion" in his *Dictionnaire Raisonné de l'Architecture Française*]. The Cathedrals of Amiens, Paris, Bourges, the Sainte-Chapelle, and many other buildings, were undoubtedly designed upon some such system, and it may be safely asserted that nothing gives such an idea of the unity of design as the observance of certain fixed rules of proportion throughout.

Pullan married, on the 24th February 1859, Miss Mary L. Burges, a daughter of the well-known engineer, and sister of the late William Burges, A.R.A., the celebrated architect. Mrs. Pullan shared the dangers and hardships of a residence in Asia Minor with her husband. On the death of William Burges, they removed to the house Burges built for himself in the Melbury Road, Kensington. Pullan, who had long suffered from bronchitis, died at Brighton, 30th April 1888, leaving his widow, but no family.*

GEORGE AITCHISON.

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* Since writing the foregoing notice, the church of Santa-Sophia at Thessalonica has been burnt down; and it may be useful to note that plans, elevations, and sections of the church, as well as coloured examples of the mosaics, are given in Texier and Pullan's *Byzantine Architecture.*—G. A.

LXXVI.

CHARLES ROBERT COCKERELL, R.A.

SECOND PRESIDENT OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS, 1860–61

By Professor Aitchison, A.R.A., *Vice-President.*

[Additional Paper, not read at a Sessional Meeting.]

THE portrait of the late Professor Cockerell, given as the frontispiece to this volume, is from a picture, in the rooms of the Institute, by Richard Boxall, R.A., painted after the Professor was President. It depicts a handsome, intellectual, and refined head, a true exponent of the inward man. Although his memory is still green amongst the architects of the day, it was thought that a slight sketch of Cockerell, by one who sat at his feet, might not be unacceptable.*

Charles Robert Cockerell was the son of Samuel Pepys Cockerell and Anne Wetham, his wife, and was born in 1788. His father was a pupil of Sir R. Taylor, and a well-known architect and surveyor, who succeeded George Gwilt, and was succeeded by Wilkins, as Surveyor to the East India Company. Charles Robert Cockerell was for some years at Westminster School, and left when he was between sixteen and seventeen to enter his father's office. Some of the details of his father's church at Banbury are by his hand. When he was twenty-one he assisted Sir Robert Smirke with Covent Garden Theatre. In 1810 his father was anxious that he should improve his taste by travelling; but Italy was closed, the Peninsular War was raging in Spain, France and Germany were in the hands of Napoleon, and there was war between Turkey and Russia; but as the interior of Turkey was not more disturbed than usual, and Englishmen were well received in lands ruled by the Porte, it was determined that thither he should go. In April 1810 he started from Plymouth on a twelve-gun lugger, the *Black Joke*, well furnished with letters, and

* Much of the information contained in this sketch has been supplied by Cockerell's son, Mr. S. Pepys Cockerell, and by Mr. J. E. Goodchild, the Professor's principal assistant. I have also derived assistance from "Some Account of the Professional Life and Character of the late Professor C. R. Cockerell, R.A.," &c., by Sydney Smirke, R.A., in Transactions, 1863–64.—G. A.

bearing despatches obtained through the influence of Mr. Hamilton. What excitement travelling offered in those days! They had not been twenty-four hours out before they captured a prize, and Charles Robert Cockerell became entitled to a share of the prize-money. In the Bay of Biscay they met two French privateers, who, however, sheered off. The lugger had to put into Cadiz to deliver despatches for the British fleet, while the French were besieging the town on the land side. The *Black Joke* then sailed for Constantinople, and having landed Cockerell, started homewards. On the way back she was captured by French privateers, and taken into Algiers, and Cockerell's sketches and journals up to that time were lost.

There were great difficulties in the way of study in Constantinople: to be seen drawing even from a window was dangerous; to be found going over one of the Sultan's kiosks might cost both guide and sightseer their heads; but by dint of audacity and bribery Cockerell managed to make some careful studies of Turkish architecture. After a stay of a few months he made his way down by the Troad and Salonica to Athens, and there fell in with an agreeable company—Lord Byron, Baron Haller, and Baron Stackelberg, the Chevalier Brönstedt, M. Koes, Herr Linckh, and Foster, an English architect from Liverpool. Amongst other expeditions, one was planned to Ægina, then a dangerous place to visit, for he says: "As we got up to the Temple we "could see the boats of the pirates on the shore near Sunium." The discovery of the marbles is related in his great work, *The Temples of Jupiter Panhellenius at Ægina, and of Apollo Epicurius at Bassæ*; but the difficulties of getting these marbles to the shore, then to Athens, of avoiding the rapacity of Turkish authorities, of transporting them to Zante, &c., were immense. The statues from the pediments of Ægina (casts of which are in the Archaic room of the British Museum) were taken to Malta for safety, after they had been advertised for sale at Zante. The keeper of the antiquities at the British Museum, the British agent, knowing them to be at Malta, went there; but the King of Bavaria's agent went to Zante, and they were knocked down to him without competition. Cockerell was heartbroken at this misadventure. He made a tour through the Morea on his way back to Athens. He dug for a day or two at Olympia, but finding it impossible to make the Greeks work, and the remains lying very deep, he was obliged to leave. At Phigaleia he encamped for ten days, but as the petty authorities of the district did their utmost to interfere with him, he was obliged again to desist, though not until he had discovered one portion of the bas-reliefs now in the British Museum, which he re-covered with earth before it was noticed, promising himself to come again shortly and secure it. Thence he passed into Maina, a corner in the south of the Morea, which had always retained its independence of the Turks. His party, however, found themselves surrounded with too many dangers in that lawless district, and were again forced to retreat. Thence he passed, by Argos and Mykene, to Athens. Arrived there, he again found an opportunity of profiting by the protection afforded to a sort of official mission, the nature of which it is no longer possible to find out, to make a journey in Candia; but the jealousy of the Turks prevented his making either drawings or researches.

On leaving Crete he was all but wrecked in a storm. He says: "We were within "three yards of the rocks by the time the anchor held"; and with difficulty they got landed on the coast of Asia Minor, at Scala Nuova, near Ephesus. This was the starting point for a tour in the interior to Sardis and Hierapolis, which latter place he immensely admired, and made many sketches of; it would be interesting to know how much there is left of what he then saw.

There is no account of how he got back, but we next find him, in the early part of 1813, in Athens, organising the second expedition to Phigaleia to unearth the treasures he had caught a glimpse of on his first visit. Besides his companions of the Ægina expedition, several other travellers joined him, and, to evade the difficulties he had met with in his first attempt, preparations were made on a larger scale, firmans clearer and more authoritative being obtained with which to silence the obstructiveness of the petty local dignitaries. There is no journal written at the time, but some account is given in the book on Ægina and Bassæ. This expedition was a picnic from beginning to end, and the marbles found were successfully brought to Athens. The sale of them, at which Cockerell must have been present, was announced for May 1814, and the intervening time seems to have been filled up, first by a serious illness of three months, and on his recovery by a journey into northern Greece. He met Messrs. Hughes and Parker (the former of whom afterwards published an account of his travels), who were well provided with passes and recommendations and other necessaries of travel in those countries. This opportunity was too good to be lost, and, accordingly, he accompanied them to Thebes, Plateia, Orchomenus, Delphi, Salona, anciently Amphissa. Thence by boat, when he was very nearly wrecked again, along the coasts, putting into various ports, up to Arta, on the Ambracian Gulf, where they took horse for Janina, in Epirus, the capital of the terrible Ali Pasha. There is one beautiful drawing of the elegant, if rather flimsy architecture of Ali's Palace, including a portrait of the tyrant himself. These and the other rougher sketches are probably the only records of this portion of his travels, for all else was destroyed a few years later. They returned, by routes pregnant with adventures, through Thessaly to Athens. It was apparently soon after the sale of the Phigaleian marbles to England that Cockerell accepted the invitation of Captain Beaufort, R.N., then engaged on a survey of the southern coast of Anatolia, to join him. There is no record of his own of this cruise, but it seems to have been brought to an abrupt close by a brush with the natives at the Castle of Ayaz, somewhere near Scanderoon, in which one officer, Mr. Olferd, was killed, and the captain himself wounded so seriously as to oblige him to sail for Malta, taking Cockerell with him, who nursed him devotedly. But the sedentary life, after so much activity, disagreed with Cockerell, who was laid up for several weeks at Malta. Getting away as soon as he could from the military society, which was not much to his taste, he took a passage to Palermo, and made a tour of the island, of which there is an account in one of his occasional diaries. The chief event in it of interest to us, is his arrangement of the fragments of the giants in the temple at Agrigentum, which excited great attention at the time, and added to a reputation rapidly spreading.

The antiquities of Syracuse arrested his attention, and he spent three months there studying them, besides learning to cut cameos and to play the guitar.

Here, unhappily, the journals come to an end. He was not fond of writing, and except when stirred by exciting scenes, or by enforced idleness on board ship, he kept no diary, and his later letters have been lost. He made an abortive attempt after his return to write up his travels, but it never got beyond a dozen pages. From this time his life became less adventurous. At Naples, Rome, and Florence he continued his archæological researches. At the first city he produced his beautiful drawing "A Restoration of a Pompeian house," at Rome his "Restoration of the Forum," and at Florence his suggestions for the arrangement of the Niobe group; but most of his attention was given to the study of Italian architecture, with a view to his future practice. In the course of his travels he had more than one serious illness: one, probably typhoid, very nearly put an end to his career. Medicine was in a very barbarous condition in those countries; bleeding was the first as well as the last remedy, and on this occasion, when he was almost gone, live pigeons cut in half were applied to his heart, to revive his natural heat by their warmth.

Cockerell always considered himself to have been an unusually lucky man, but the chief of the luck lay in the constitution of his mind, for fortune will mostly meet half-way a man of genius so lively, so enterprising, and so energetic. Before his companions were out of bed in the morning, Cockerell was away drawing, or at his studies. No discomfort or hardship kept him away from anything worth visiting. He was indeed the first to make a rush for a bath, Turkish or otherwise, whenever the chance came, but he was not to be deterred from visiting a place of interest by the absence of a bath or of a bed. He slept on the floor night after night, or when that was impossible, owing to fleas or worse, he describes himself as sitting up all night smoking. When his energies were not fully engaged by his studies, as at Syracuse, he took up, as I have said, with cutting cameos, or with playing on the guitar, though he had no special aptitude for music. These incidents are only worth mentioning as showing the restlessness of his spirit.

In 1814, and still more after Waterloo, the Continent generally was opened up, and travellers swarmed to Rome from all parts. There Cockerell made many friends, whom he retained all through life. Many were people of position, and more were persons of eminence in art or letters. On his way home from Italy he seems to have passed some time in Paris, but there is no record of what he did there, and he finally returned to England in 1817, whither a great reputation for draughtsmanship, taste, and research had preceded him. After his return we read, in Sydney Smith's letters, of young Cockerell being engaged in arranging the sculpture at the British Museum.

It may here be remarked that his skill as a draughtsman was considerable when he started, and was doubtless perfected by exercise during his sojourn abroad. On his return his folios were filled, not only with sketches and measured drawings of buildings, but with scenery, and portraits of his friends, and of striking personalities amongst the natives of the countries he travelled in. His sketch-books, and drawings made while

abroad, have been presented to the British Museum by his son, Mr. S. Pepys Cockerell. He devoted much of his time while abroad to making drawings of Greek sculpture, and probably it was during this time that he discovered he had as much genius for designing sculpture as for architecture and archæology.

Shortly after his return he engaged in practice. His principal early works were the Literary and Philosophical Institution at Bristol, Harrow Schools, additions to Bowood for Lord Lansdowne, Hanover Chapel in Regent Street, and the Westminster Insurance Office in the Strand. In 1833–35 he built the new Dividend Office at the Bank of England, and competed for the Houses of Parliament, the drawings of which are in the Diploma Gallery of the Royal Academy. From 1834 to 1840 he built Seckford Almshouses at Woodbridge in Suffolk, Harrow School Chapel, the University Library at Cambridge, and, in conjunction with Sir W. Tite, the London and Westminster Bank. He also built a Chapel at Killerton for Sir Thomas Dyke Acland, the Taylor and Randolph Buildings at Oxford, a house for Dr. Marsham at Caversfield; and he competed for the Reform Club and the Royal Exchange.

In 1842 he built the Sun Fire Office, Threadneedle Street; in 1843 he made alterations to Peper Harrow, Godalming, for Lord Midleton; in 1844–45 new branches of the Bank of England at Plymouth, Bristol, Manchester, and Liverpool were erected from his designs, and he competed for the Carlton Club; in 1846 he added to the National Debt Office, Old Jewry, and to St. Bartholomew's Church, Moorfields; in 1847 he was engaged on the completion of Basevi's Fitzwilliam Museum, Cambridge; in 1848 he worked on the fortification of the Bank of England, and the conversion of the Dividend Office into the Drawing Office. In 1851 he was employed to complete Elmes's St. George's Hall at Liverpool; in 1852 he made additions to "The Grange" in Hampshire for Lord Ashburton, and designed the fittings for the lying-in-state of the Duke of Wellington at Chelsea Hospital, in October of the same year. In 1855 the Liverpool and London Insurance Office at Liverpool, where he used some of the internal iron columns as smoke flues, was erected from his designs; this beautiful and artistically finished building is quite a gem. He was also the architect of a monument at Chelsea Hospital to the officers and men who fell in the Indian Mutiny, and of a tomb in the Cemetery, Brighton, to H. J. Prescott, the banker.

He published works on the Temples of Jupiter Olympius and of Hercules at Agrigentum, which were again published as part of the supplement to Stuart and Revett's *Antiquities of Athens and other places in Greece, Sicily*, &c., fo. London, 1830; in 1846 an Essay on the works of William of Wykeham, in which he dissipated the idea that it was impossible for a great architect to fulfil the duties of a Chancellor; in 1851 the iconography of the west front of Wells Cathedral; in 1857, in conjunction with Canina and Harford, a work on the genius of Michelangelo Buonarroti; and in 1860 his great work on the Temples of Jupiter Panhellenius at Ægina, and Apollo Epicurius at Bassæ. In the same year he wrote an account, in a pamphlet form, of the sculptures of the west front of Wells Cathedral. He also contributed at various times articles to the Dictionary of the Architectural Publication Society.

He exhibited a drawing at the Royal Academy in 1838 called "A Tribute to the "Memory of Sir C. Wren," which was afterwards engraved and published; his beautiful drawing of the restoration of the Mausoleum has never been engraved, though there is a sketch of it in Mr. Falkener's *Museum of Classical Antiquities.*

There is a beautiful pencil drawing of Cockerell by Ingres, the great French painter, a facsimile of which is given opposite.* It was probably executed in Rome about 1815–16, when he was about twenty-six and Ingres thirty-three years of age.

Among the executed works of that galaxy of architects, Soane, Wilkins, Barry, Elmes, and himself, who were inspired by the study of Greek art, Cockerell's were most distinguished by the amount of his own individuality he infused into them; by the grace and elegance of their mouldings, and by the refinement and invention in their ornament, sculpture, and metal-work. This is not to be wondered at if we consider that he was one of the few distinguished English architects who was an admirable draughtsman of the human figure. His skill as a designer of sculpture induced Elmes to ask him to adapt his design for the frontispiece of a public building (1843), to the pediment of St. George's Hall. A drawing for the altered sculpture was exhibited at the Royal Academy in 1845, and this design was carried out under his superintendence. His published works on Archæology are masterpieces; his skill, taste, and knowledge made his restorations of Greek ruins as valuable as they were beautiful. To Cockerell and Donaldson, who were linguists, had travelled, and had a large acquaintance among foreign architects, we mainly owe the greater intercourse we now enjoy with our brethren abroad; and Cockerell's architectural and artistic skill gave our foreign architectural brethren a higher appreciation of English architecture.

In 1829 he was elected A.R.A., in 1836 R.A., and in 1840 Professor of Architecture to the Royal Academy. He was a Chevalier of the Legion of Honour, a Member of the Institute of France, of the Royal Academy of Belgium, of St. Luke's at Rome, of the Royal Academies of Munich, Berne, Denmark, Genoa, and Athens, and of the American Institute of Architects; and he was a D.C.L. of Oxford.

The services he rendered to the rising architects by his Royal Academy Lectures have, it is to be feared, fallen into oblivion. Being a man of fortune, he devoted to his lectures and their illustration three or four times the stipend he received; being a traveller, a scholar, a man of reading, an admirable draughtsman, a distinguished architect, and possessing a splendid architectural library, he not only presented to the students admirable drawings of the great works of former times, opened out to them all the recondite literature of architecture, but stimulated them to rival the best of their predecessors, and did not fail to draw their attention to the merits of former

* Sir F. Leighton, Bart., P.R.A., in a letter to the author makes the following remarks:—"I have looked "with great interest at the beautiful drawing by Ingres of Professor Cockerell, which you have allowed me to "see. I had indeed the good fortune during a good many years to know the charming and distinguished man "there represented, but it was only in the later portion of his life, and I am not in a position to pronounce on "the drawing as a likeness; that it is in my eyes a most valuable possession as a work of art I need hardly say. "Great as Ingres was, he shone in nothing more than his pencil portraits, which for vivacity, delicacy, dignity "of treatment, and style, are not easily to be surpassed. The portrait of the brilliant architect whose life you "are sketching, is an excellent specimen of that phase of the great French draughtsman's genius."—G. A.

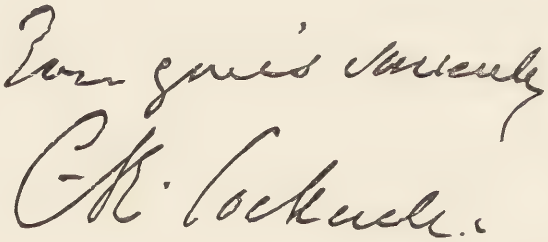
works, nor to warn them against errors into which some of the great architects had fallen. The lecture-room was always crowded with members of the Royal Academy, students, and others, anxious to hear him and to see his illustrations. The students hung upon his utterances; and while lecturing he would often pause, and then say, "and so "on"—he had dropped the thread of his discourse, forgotten his audience and the lecture-room, and was in Athens admiring the Parthenon and communing with Pericles and Phidias. At other times he would pour out vivid pictures of the glories of Athens, Syracuse, or Rome.

It was feared that his lectures had perished, but since writing this they have been found. His great diagram of the principal buildings in the world was presented to the South Kensington Museum after the death of his son, Frederick Pepys Cockerell; and at the same time many splendid drawings illustrating his lectures were presented to the Royal Academy. Thanks to the courtesy of the latter, a photographic reproduction of his Restoration of Caracalla's Baths was published last year in *The Builder*.* He was a most amiable man, and by his kindness, courtesy, and praise, gave encouragement to the younger members of the profession.

In 1819 he was appointed Surveyor to the Fabric of St. Paul's, and in 1833 he succeeded Sir John Soane as Architect to the Bank of England. He was presented, in 1848, with the first Royal Gold Medal, and he was our first professional President.

He died on the 17th September 1863, and was buried on the 24th of the same month in St. Paul's Cathedral. In the roll of British architects few have brought so many titles to admiration: ripe scholarship, exquisite delineation, masterly composition, uprightness, integrity, genius, and enthusiasm, and withal the dignified and refined manners of the high-bred English gentleman.

GEORGE AITCHISON.



* See also a reduced copy of this plate in TRANSACTIONS, Vol. V., N.S., pp. 120-121.

INDEX TO VOLUME VI. NEW SERIES.

References are given to subjects, as well as to authors, of Papers and Remarks. The title of each Paper is given in full under the author's name, preceded by a reference to the principal subject treated of, and followed by a list, in the order of their occurrence in the Paper, of the principal items where these cannot be conveniently placed under the subject itself.

Under subject-headings are arranged, each in alphabetical order:—1st, Titles of Papers in an abbreviated form; 2nd, Local names and references; 3rd, Sub-headings, with subordinate sub-heads run on.

Under name-headings are arranged, each in alphabetical order :—1st, Papers read or Remarks made by the individual; 2nd, Incidents and subjects connected with him.

An asterisk (*) following an item denotes that there are illustrations or an illustration connected with it.

Achen—
Mausoleum erected by Charlemagne, 70.
Ægina, 52, 256.
Aitchison, Prof.—
Charles Robert Cockerell, R.A.,* Notice of, 255.
Notice of the late Mr. Pullan, F.S.A., 249.
Remarks on the application of iron and steel to building purposes, 36.
Altar—
Christ College Chapel, Brecon, 176.
Glewstone Church altar-table,* 177.
St. Barnabas, Gorse Hill, 173.
St. James's, Great Yarmouth, 176.
Newland Church, dimensions of high altar, 185.
St. Stephen's, Walbrook.*—Replacing of part of Sir C. Wren's altar-piece,* 248.
Altar-Rails—
Holmer Church, 177.
Norwich Cathedral,* 177.
Ancient Lights—
London.—Provisions in building leases against acquiring right to,* 132.
"Prescription Act of William IV.," 132.
Rome.—Institution of rights of light and prospect, 200 B.C., 117.
Scotland.—Right non-existent, 132.
Anderson, J. M.—
Remarks on the architecture of Provence, 85.
Ante-Nave—
*Note on the Galilee of Durham Cathedral,** 153; —The ante-nave, or porch, part of systematic arrangement of Benedictine abbey churches, 153; Cistercian and Cluniac examples in Western Europe, 153–160; early Christian churches modelled on the Roman basilica, 155; basilica-shaped churches, 157; object of the ante-nave, 159; authorities quoted, 160–163; its use in connection with the penitentiary discipline of the primitive Church, 160; other ceremonies performed in the ante-nave or porch, 162; French laws prohibiting its use for the trial of criminals, 163; a common feature in the great churches of Western Europe in the twelfth and thirteenth centuries, 164; no evidence of their being used as Lady chapels, *ib.*; Durham Cathedral also a Benedictine abbey church, *ib.*; the same rule and ceremonies observed in all Benedictine abbeys, *ib.*; the ante-nave as necessary in England as on the Continent, *ib.*
Dover.—Old St. James' Church, 148; transeptal annexe containing three arched recesses,* 148, 149, 164; used as the Lord Warden's court in the Middle Ages, 148; now obliterated, 149.
France.—Autun Cathedral, 155;—Bordeaux, church of Saint-Séverin, 154; Cluny Abbey church, now destroyed, 151; ground plan,* *ib.*; ante-nave at western end, *ib.*; its probable use, 152;—Châlon-sur-Saône Church, 163;—Charité-sur-Loire Church, 151; the ante-nave, 151, 153, 163;—Châtel Montagne Church, 155;—Créteil Church, *ib.*;—Dijon, Notre-Dame, *ib.*;—Moissac Abbey church, 154; two-storeyed porch, *ib.*;—Moutier Church, *ib.*;—Paray-le-Monial Church, *ib.*; two-storeyed porch, flanked by towers, *ib.*; plan, west elevation, and section through nave and ante-nave,* 156, 157;—Paris, Saint-Denis, 153; the ante-nave, *ib.*; Poissy Church, 155; —Poitiers, church of Saint-Savin, *ib.*;—Pontigny Abbey church, 154; plan,* 158;—Tournus Church, 153; closed porch at the western end, *ib.*;—Toury Church, 154;—Vézelay Abbey church, 151; vestibule church, with triforium, at western end, 151, 153; its probable use, 152; plan of abbey church,* 154; section of ante-nave and part of nave,* 155.
Italy.—Milan, San-Ambrogio, 157;—Parenzo, basilica-shaped church, *ib.*; plan,* 159;—Ravenna, San-Apollinare-in-Classe, 157; San-Apollinare-Nuovo, *ib.*; plan,* 158;—Rome, San-Clemente, 155; plan,* 158.
Melton Mowbray Church, 151.
Snettisham Church, Norfolk, 151.
Spain.—Avila, San-Vicente, 161; western portal,* 161, 162;—Oviedo Abbey church, 159;—Valdedios Abbey church, 159; plan and section,* 160.
Syria.—Roueiha Church, 157; plan and section,* 159.
Switzerland.—Romainmotier Church, a remarkable example of early triple division, 158; nave columns, and arches,* 160; view and plan, *ib.*
Wiggington Church, Bucks, 151.

Apethorpe Hall*—
Carved gables and finials, 98; contains work of the sixteenth and seventeenth centuries, *ib.*; its present condition, 99.

Application of Iron and Steel to Building Purposes*—
Paper, by F. T. Reade, 13.
Remarks by Prof. Aitchison, 36; R. L. Cole, *ib.*; Prof. Kerr, *ib.*; J. T. Perry, *ib.*; R. Walker, 35; T. H. Watson, 36.
Reply, by F. T. Reade, 36.

Arab House of Egypt*—
Paper, by Count R. d'Hulst, 221.
Notes on, by R. Phené Spiers, 228.
Notes on, by J. D. Crace, 237.
Remarks by W. A. Boulnois, 241; W. Brindley, *ib.*; R. H. Carpenter, *ib.*

Arch—
Eleusis.—Triumphal arch of the Emperor Hadrian, 50.
Infrequent use of the horse-shoe form in Arab houses in Cairo, 225.

Architectural Societies—
Non-metropolitan societies in alliance with The Royal Institute, 1.

Architecture of Provence*—
Paper, by D. MacGibbon, 69
Remarks by J. M. Anderson, 85; E. P. L. Brock, *ib.*; H. W. Burrows, 86; C. Douglas, 85; R. P. Spiers, *ib.*; E. J. Tarver, *ib.*; W. White, *ib.*; A. N. Wilson, 86.
Reply, by D. MacGibbon, 86.

Athens—
The Acropolis, 37; formation of the natural rock, *ib.*; marble statues found near the Erechtheion, 38; supposed remains of the palace of Erechtheus, *ib.*; discovery of fragment of large Ionic cap in Peiraic or Poros stone, *ib.*; of stone foundations of supposed temple, *ib.*; of remains of temple of Roma and Augustus, *ib.*; of two heads and portions of two pediments in coloured Poros stone, *ib.*; of unfinished marble drums for the Parthenon colums,* *ib.*; uncovering of lower stylobate of the Parthenon, *ib.*; supposed foundation-walls of the Chalkotheke, 39; discovery of mason's bronze tools,* *ib.*; of marble head of Iris, and other fragments, 40, 41; the Temenos of Artemis Brauronia, 40, 43; removal of Turkish remains from west end of Acropolis, 41; curvature of the second step of the Parthenon stylobate,* *ib.*;—The Propylæa,* 42; remains of earlier buildings, *ib.*; original design of present buildings, *ib.*; date of commencement, *ib.*; the portions completed, *ib.*; the south-west wing, *ib.*; unfinished condition of the wall-surface, 43; the great stylobate,* *ib.*; form of joints of walls,* *ib.*; the door-frames,* 44; section of the two inner halls,* *ib.*; the north-east hall,* 45, 46;—Theatre of Dionysos, 46; remains of the earlier theatre, 47; remains of the first and second temples of Dionysos, *ib.*; the permanent stone Theatre of Dionysos, *ib.*; fixed architectural back-scene, *ib.*; arrangement of the stage, orchestra, and seating,* 48, 49; marble thrones of the priests of Dionysos, 48; the great stoa between the theatre and the Odeion, 49; mode of construction, *ib.*

Bassæ—
Temple of Apollo Epikourios, 53; peculiarity of the fluting of the internal Ionic Order,* *ib.*

Béziers Cathedral—
Ornamental machicolations and parapets, 80.

Birmingham—
Assize Courts, 8.

Blashill, T.—
Remarks on the Galilee of Durham Cathedral, 152.

Blomfield, Sir A.—
Knighthood conferred on, 3.

Boulnois, W. A.—
Remarks on the Arab house of Egypt, 241.

Brigstock—
Renaissance cottages at, 101.

Brindley, W.—
Remarks on the Arab house of Egypt, 241.

Bristol—
Society.—Alliance with The Royal Institute, 1.

Brock, E. P. L.—
Remarks on the architecture of Provence, 85.

Bruton, E. G.—
Remarks on the Renaissance in Northamptonshire, 114.

Brydon, J. M.—
Remarks on the Renaissance in Northamptonshire, 114.

Building Legislation*—
Paper, by J. Slater, 115.
Remarks by H. H. Collins, 139; H. Dawson, 137; B. Fletcher, 139; C. Fowler, 138; E. T. Hall, *ib.*; C. F. Hayward, 139; Prof. Kerr, 138; L. W. Ridge, 139; E. C. Robins, 137; T. R. Smith, 139.
Reply, by J. Slater, 140.
Byzantium.—Power to control height of buildings in, 117.
France.—Rule as to thickness of walls of buildings, 126;—Paris: buildings permitted to back on to one another, 129; rule as to height of buildings,* *ib.*
Germany.—Berlin: Provision to insure safety of scaffoldings, 216; official form of specification for erection of walls of buildings, 217; —Rule as to height of buildings in Munich, 129;—Fireproof material prescribed for staircases in most towns, 129.
Greek building law, 116; our slight knowledge on the subject, *ib.*; Athenian officials, *ib.*
London County Council.—Barking Creek Bill, 119; control of public buildings, 123; by-law as to batter of chimney-shafts, 126.
Manchester.—Regulations as to width of streets, 121; control of gradients of streets, *ib.*; regulations as to public buildings, 123; definition of a public building, *ib.*; provision against dampness, 128.
Metropolitan.—The earliest building regulations, 117; extracts from the City of London White Book, *ib.*; Acts passed after the Great Fire, 118; prohibition of wooden party-walls, 119; Act of 1774, *ib.*; chief provisions of the Act of 1844, *ib.*; the City of London Sewers Act,

ib.; Metropolis Local Management Act and Metropolitan Building Act, *ib.*; Public Health Act, 1875, *ib.*; fourteen separate Acts in force, *ib.*; absence of regulations as to construction of streets, 120; minimum width of streets, 121; public buildings, 122; regulations for prevention of fire, 124–126; provisions for insuring stability, 126; regulations for securing dryness and ventilation inadequate, 128; restrictions against crowding together of buildings almost inoperative, *ib.*; height of buildings,* 129; regulations as to party structures, 131; ancient lights: the "Prescription Act of "William IV.," 132; ruinous, dangerous, and neglected buildings, *ib.*; the settlement of building disputes, 133; appointment of official referees under the Act of 1844, *ib.*

Metropolitan Board of Works.—By-laws, 119, 120, 122; the cross-section of carriage-ways, 122; rule as to thickness of warehouse walls, 126.

New York.—Provision as to public buildings with frontage to one street only,* 123; regulations as to roofs, 125; buildings above a certain height to be provided with fire-escapes, *ib.*; height and thickness of dwelling-house walls, 126; provisions to insure stability, 127.

Rome.—Regulations in ancient Rome, 117; institution of the party-wall and rights of light and prospect, *ib.*; power to control height of buildings, *ib.*

Sweden.—Regulations as to street gradients, 122; rule as to height of buildings, 129.

Burghley House—
Relations between the workpeople and the owners, 89; John Thorpe's small scale drawings, 90; curious extracts from letters of the artificers as to details, *ib.*; time occupied in building, 90, 91; State Papers of Mary and Elizabeth regarding the building of, 103.

Burrows, H. W.—
Remarks on the architecture of Provence, 86.

Byzantium—
Power to control height of buildings in, 117.

Camden—
On the Palace of Holdenby, quoted, 93.

Canons Ashby*—
Careful preservation of, 100; contains fifteenth, sixteenth, and eighteenth century work, *ib.*

Carpenter, R. H.—
Remarks on the Arab house of Egypt, 241;—on church fittings, 186.

Castle Ashby—
Date of commencement, 101; entrance screen by Inigo Jones, *ib.*; inscription forming the parapet, *ib.*

Choir Desks and Stalls—
Rochester Cathedral,* 181, 182; St. Nicholas, Great Yarmouth, 181.

Church Fittings*—
Paper, by J. P. Seddon, 165.
Notes on, by W. White, 184.
Remarks by R. H. Carpenter, 186; S. J. Nicholl, *ib.*; E. J. Tarver, *ib.*; A. Waterhouse, *ib.*; W. Woodward, *ib.*

Altar, 176; dimensions and material, *ib.*; arrangement of altar-shelf, *ib.*; elevation of altar-table of Glewstone Church,* 177.

Altar-rails, 176; introduced in seventeenth century, *ib.*; use of, *ib.*; should stand on one step only, *ib.*; ample space to be left in front, 177; design of altar-rails at Norwich Cathedral, *ib.*

Choir desks and stalls, 180; most suitable arrangement for, 181; stall-work of Llandaff Cathedral, *ib.*; elevation of stalls, Rochester Cathedral,* 182.

Fonts, 169; position, material, and size, 169, 170; continental examples, 169; characteristics of Norman fonts, 170; position, size, shape, and materials, *ib.*; font and cover, Rotherham Church,* 170, 171; sculptured Caen stone font of Llandaff Cathedral, 170; variegated marble font, St. Margaret's, Westminster, 171; font and cover designed by J. P. Seddon,* 172; arrangement of seats around fonts, 173.

Lecterns, 175; plan and elevation of lectern at Caerleon Church,* *ib.*; position of, in a church, *ib.*; the "eagle desk," *ib.*; suitable materials, 176.

Pulpits, 173; exaggerated importance of, in continental churches, *ib.*; magnificence of some Italian examples, *ib.*; best position for, *ib.*; the "wine-glass" type, *ib.*; plan and elevation of pulpit at Gorse Hill Church, Swindon,* 174; pulpits of Llandaff and Norwich* cathedrals, &c., *ib.*; majolica ware as a substitute for marble, *ib.*

Reredos, 177; not a necessity, *ib.*; its purpose, *ib.*; in some cases essential, *ib.*; best object for the centre, 178; examples in various materials and styles, *ib.*

Screens, 181; object and effect of, *ib.*; should be of great beauty, 182; arrangement of, 183.

Seats, 178; in nave and aisles to face eastwards, *ib.*; chairs preferable in chancel aisles, *ib.*; arrangement and width of passages, *ib.*; seats should be uniform in design throughout, 179; height, distance apart, and form of seats, *ib.*; elevation of seats in Arminghall Church,* *ib.*; seats for children, 179, 180; re-seating old churches, 179; seats should be comfortable, but not luxurious, 180; slope of back and seat, *ib.*; combination of chairs and kneeling-platform, at Grange Town Church,* *ib.*

Clarkson, S. F.—
Remarks on the Renaissance in Northamptonshire, 114.

Cockerell, C. R.—
*Charles Robert Cockerell,** by Prof. Aitchison, 255;—His parents, *ib.*; educated at Westminster School, *ib.*; early works, *ib.*; voyage to Turkey, *ib.*; dangers of the voyage, 256; difficulties of study at Constantinople, *ib.*; expedition to Ægina, and discovery of the marbles, *ib.*; first visit to Phigaleia, *ib.*; obstruction by the authorities, *ib.*; tour in Asia Minor, 257; second visit to and discoveries at Phigaleia, *ib.*; serious illness, *ib.*; journeys to northern Greece, Janina, the

Cockerell, C. R. (*continued*)—
southern coast of Anatolia, and Palermo, *ib.*; arrangement of the fragments of the giants in the temple of Agrigentum, *ib.*; archæological researches in Italy, 258; his energy of character, *ib.*; arrangement of the sculptures at the British Museum, *ib.*; his skill as a draughtsmen, *ib.*; principal works, 259; literary productions, *ib.*; his architectural and artistic skill, 260; honours, *ib.*; his Royal Academy Lectures, 260; death, and burial in St. Paul's Cathedral, 261.

Cole, R. L.—
Remarks on the application of iron and steel to building purposes, 36.

Collins, H. H.—
Remarks on building legislation, 139.

Combe, T.—
"Illustrations of Baptismal Fonts," quoted, 169.

Constantinople—
Church of Justinian, 239.

Crace, J. D.—
Notes on the Arab House of Egypt,* 237.—Beauty and elaboration of detail, 238; intricacy of design, *ib.*; the "reversible system of "ornament," *ib.*; the use of written inscriptions, *ib.*; restricted use of carving, 239; contrast of light and dark material, *ib.*; inlaid ornament in coloured marbles, *ib.*; Persian origin and design of glazed tiles used in interior decoration, *ib.*; the timber ceilings of the mandarah and ka'ah, 240; their richness of decorative effect, and contrast with the quiet colouring of the walls, *ib.*; harmonising effect of the rich colours of divan covers and carpets, *ib.*

Cupola—
Paris.—Palaces of the Fine Arts and Liberal Arts, 4.
Persia.—Perforated domes fitted with coloured glass, at Serbistan, 233.
St. Stephen's, Walbrook,* 247.

Cyprus*—
Report of a tour in, by R. E. Smith, 57.
Hill fortress of Leondari Vouno, 57.
Kouklia (on the site of Palæo-Paphos), 57, 59.
Temple of Aphrodite, 57; extraordinary irregularity of the plan, 59; work of widely different epochs, *ib.*; extensive Roman remains, 60-64; walls of the first and second pre-Roman periods,* 60, 61; original scheme of the pre-Roman work, 61; the south stoa,* 62; the central hall, 63; the third pre-Roman period,* 64; general character of the Roman remains, *ib.*; discovery of Cypriote, Latin, and Greek inscriptions, *ib.*; principal articles found, 65 *note.*

Cyprus Exploration Fund—
Excavations at the Temple of Aphrodite, 57.

Damascus—
Ancient Arab house, 236; plan* and description, *ib.*; showy and debased type of decoration in modern houses, 237.

Date Stones—
At Bulwick, Twywell, and Weldon, Northamptonshire,* 102.

Dawson, H.
Remarks on building legislation, 137.

D'Hulst, Count R.—
Egypt. *The Arab house of Egypt*,* 221;—Causes leading to the destruction of Arab houses, *ib.*; principles of their plan in various parts of Egypt, 222;—General description of the Cairo Arab house,* *ib.*; infrequent use of the horse-shoe arch in Cairene Arab houses, 225; all decoration, exterior and interior, the work of the architect, *ib.*; adaptability of the style to modern requirements, 226;—Count St. Maurice's house,* constructed entirely of ancient material, *ib.*; decadence of Cairo as an Oriental town, *ib.*;—Arab houses of the towns of the Lower Delta and along the sea-shore, *ib.*; modes of embellishment, *ib.*; superabundance of columns in Rosetta, 227; the woodwork of the windows, *ib.*; interior arrangement, *ib.*; ruinous condition of the houses, 228.

Dillon, F.—
Water-colour drawings exhibited in illustration of the Arab house of Egypt, 237 *note.*

Dingley Hall—
Notable remains of early Renaissance, 89; eccentric mouldings, *ib.*; curious inscriptions, *ib.*

Dinoyso—
Remains of a Byzantine church, 51; discovery of inscription describing it as a choragic monument, 52; plan and section,* *ib.*

District Surveyors—
Powers and duties in the administration of building law, 124, 125, 127, 133, 134-136.

Dome, *see* **Cupola.**

Dörpfeld, Dr.—
Cited on the remains discovered at Athens, 38, 39, 41, 42, 43; on the plan of site of Eleusis,* 50; on the palace at Mykene, 54.

Douglas, C.—
Remarks on the architecture of Provence, 85.

Dover—
Old St. James' Church, 148; transeptal annexe containing three arched recesses,* 148, 149, 164; used as the Lord Warden's court in the middle ages, 148.

Drayton House*—
A storehouse of architecture, 99; exterior of one wing entirely of the same date, 100; the Elizabethan vaulted cellars, *ib.*

Durham Cathedral*—
The Galilee of Durham Cathedral, by W. White, 141.
Ground plan,* 144.
See **Ante-Nave** *and* **Galilee Porch.**

Education—
Professional, 6.
Technical, in Germany, 187-215.

Egypt*—
The Arab house of, by Count R. d'Hulst, 221.
Alexandria.—Houses consist of several floors, 226; constructed entirely of brick, *ib.*; the woodwork of the windows, 227.
Assiout.—Interesting style of brick architecture, 227.

Cairo.—General description of Arab house,* 222, 228; the exterior towards the street, *ib.*; the ornamentation of the outer door, 222; the entrance, 223, 228; the vestibule, 223; the chief court, 223, 228; the takhtabosh, 223; the mandarah, or men's reception-room,* 223, 229, 232; the mak'ad, 223; the hareem, 224; the ka'ah, or women's reception-room,* 224, 229; the distinction between the mandarah and the ka'ah, 225, 229; plan of first floor,* *ib.*; of top floor,* 230; rich ornamentation of the ceilings, *ib.*; the courtyard,* 231;—The House of the Mufti,* 233; the mandarah,* 233, 236; the fountain in the dur-ka'ah,* 234.

Damietta.—Ornamentation of doorways, 226, 227; of windows, 227; interior arrangements, *ib.*; general plan of houses, *ib.*

Mansurah, 226, 227.

Matarieh, 227.

Mehalla-el-Kebir, 226; the interior arrangements, 227.

Menzaleh, 226, 227.

Mosques.—Barkuk, 228; Bordheny, Cairo,* 234; Damietta, 227; El-Zaghloul, *ib.*; Kait Bey, 227, 228; Mansurah, 227; Sultan Hasan, 239.

Rosetta.—Ornamentation of doorways, 226; general use of pillars at the angles of houses, 227; windows, ceilings, and roofs, *ib.*; general arrangement, *ib.*

Samanoud, 226.

Eiffel Tower, 4, 14.

Electric Light—

Extensive use of, in Berlin, 215.

London Electric Light Corporation, 124.

Eleusis—

Plan of the site,* 50; Temple of Artemis, *ib.*; triumphal arch of Hadrian, *ib.*; the great and lesser Propylæa, *ib.*; Temple of Pluto, *ib.*; the Great Hall of Initiation (Temple of Ceres),* *ib.*; five times built and five times destroyed, *ib.*; general character of the five buildings, *ib.*

Ely Cathedral—

The Galilee,* 147.

See **Galilee Porch.**

Epidauros*—

Temple of Asklepios, 53;—The Tholos of Polykleitos,* *ib.*; discovery of beautiful Corinthian cap,* 54;—The theatre, 54.

Exhibition—

Paris International, 4.

Fletcher, B.—

Remarks on building legislation, 139.

Font—

Adforton Church, 173; Cwmbran Church, *ib.*; East Dereham Church, 170; St. Barnabas, Gorse Hill, 173; Great Kimble Church, 170; Hook Church, 171; Limburg Cathedral, 169; Llandaff Cathedral, 170; St. Peter Mancroft, Norwich, *ib.*; Redruth Church, *ib.*; Rotherham Church, font and cover,* *ib.*; Trunch Church, *ib.*; Ufford Church, *ib.*; Ullenhall Church, 173; St. Margaret's, Westminster, 171.

Seddon, J. P.—Font and cover designed by,* 172.

Forth Bridge—

Pier foundations, 14.

Fountains Abbey—

Discovery of remains of a Galilee porch, 154.

Fowler, C.—

Remarks on building legislation, 138.

Fréjus Cathedral*—

The baptistery,* 72, 73; plan of cathedral,* 77, 78; fortified square tower inclosing eastern apse, 80; the cloister, *ib.*

Galilee Porch*—

Durham Cathedral, by W. White, 141.

Note on, 153.

Remarks by T. Blashill, 152; S. J. Nicholl, *ib.*, *note* 164; T. J. Willson, 153.

Reply by W. White, 153; *note*, 164.

Durham Cathedral Galilee, 141; remarkable specimen of late Norman work, *ib.*; its plan,* 141, 142; diverse traditions regarding its original purpose, 141; commonly supposed to have been built as a Lady chapel, *ib.*; Canon Greenwell quoted as to its erection and object, 142; first commenced at east end, and transferred to west end, *ib.*; description of the Galilee from a sixteenth century MS., 143; other authorities quoted as to its name and purpose, 144, 146, 150, 163; date of erection, 145; used as a consistory court long before the Reformation, *ib.*; origin and meaning of the word "Galilee," *ib.*; Hebrew meaning of the word, *ib.*; built by Bishop Pudsey probably as a Palatine court and regal court of justice, 146; architectural features favouring this conclusion, 147; arched recess in east wall, with paintings appropriate to a judgment seat, 148; the altar not dedicated till the fifteenth century, *ib.*; its use as a consistory court in the last and the present centuries, 150.

Ely Cathedral Galilee,* 147; built upon an unusually large scale, *ib.*; date of erection, *ib.*; portions of an older building incorporated into the present one, *ib.*; rich specimen of Early Pointed work, *ib.*

Fountains Abbey.—Discovery of remains of a Galilee, 154.

Lincoln Cathedral Galilee, 150.

Peterborough Cathedral.—"Library" under central arch of façade called a Galilee, 149.

St. Stephen's, Westminster, and Windsor new chapel: Galilees existing in the time of Henry III., 150.

Geddington—

Renaissance cottages at, 101.

German Technical Museums*—

Paper, by F. Granger, 187.

Technical Museums.—Berlin Agricultural Museum, 190; nature and arrangement of objects, 203; the "zootechnical" collection, *ib.*; the colonial collection, *ib.*;—Hygienic Museum, 190, 203; —Industrial-Art Museum,* 192, 193; cost of building, 197; plan and arrangement,* 197, 198, 200; description of the cases, 198; grouping of exhibits, 199;—Mining Museum, 190, 202.—Chemnitz Trade Museum, 189, 192, 194; nature of exhibits, 201.—Dresden Industrial-Art Museum, 188,

German Technical Museums (*continued*)—
200. — Hamburg Industrial-Art and Trade Museum, 188, 193; cost of building and fittings, 195; plan,* 196; arrangement of floors and exhibits, *ib.*; the cases and frames, 197. —Hanover Industrial-Art and Trade Museum, 192, 201.—Leipzig Industrial-Art Museum, 200.
Technical Schools.—Berlin, 191; evening continuation schools, 213; special fittings, 214; percentage of attendance, *ib.*—Charlottenburg, 190, 194; the mineralogical museum, 204; collection of building stones, *ib.*; mechanical collection, *ib.*; collections for mechanical technology, 205; the museum of engineering construction, *ib.*; geodetic and architectural collections, 206; the building, *ib.*; departments of instruction, 207; electrotechnic laboratory, *ib.*; the technical experiments building, *ib.*—Chemnitz Agricultural School, 190, 194, 212;—Evening continuation schools, 215;—Evening school for weavers, 213;—Higher weaving school, *ib.*;—Royal Technical Institute, 208; the collections of tools, models, &c., *ib.*; fittings of the classrooms, 209; the testing department, *ib.*—Dresden continuation schools, 214;—Polytechnic, 191; system of ventilation, 207; the collections, 208; electro-technological laboratory, *ib.* — Hamburg evening continuation schools, 213;—Trade schools, 210; dimensions of rooms, 211; fittings of drawing-class room,* *ib.*;—Trade school for girls, *ib.*—Hanover evening continuation schools, 215;—Technical High School, 209; the technological and mechanical collections, *ib.*; kinematic collection, 210; the electrical department, *ib.*; ventilation and heating, *ib.*—Leipzig evening continuation schools, 213, 215.

Germany—
Berlin.—New streets and buildings, 215; the paving, *ib.*; extensive use of the electric light, *ib.*; the Thiergarten, 216; the Monument of Victory, *ib.*; circular advertisement pillars at street corners, *ib.*; construction of scaffolding, *ib.*; official regulation to insure safety, *ib.*; nature of stone used, *ib.*; excellent quality of bricks, *ib.*; official form of specification for erection of walls of buildings 217;—Ethnological Museum, *ib.*
Leipzig — Art Gallery, 189.— New buildings, 217;—The Academy of Art, *ib.*; the heating and ventilation, *ib.*; details and materials of construction, 219;—The University Library, *ib.*; cost of construction and materials used, *ib.*;—The Imperial Law Courts, 217.

Glasgow—
Institute.—Alliance with The Royal Institute, 1.

Gordon, L.—
Formula for calculating strength of cast-iron columns and stancheons, 17 *note.*

Gotch, J. A.—
Sixteenth century architecture. *The Renaissance in Northamptonshire,** 87. — Rapid spread of the Renaissance in England, 88-92; the three most illustrious builders in the county, 88; John Norden's "Delineation of "Northamptonshire," quoted, *ib.*; chief seats of the county, *ib.*; great variation in merit of Renaissance architecture, *ib.*; Northamptonshire buildings more uniform in excellence, *ib.*; abundance of capital stone a probable cause, *ib.*; principal examples of the style, 89-102; incriptions on buildings, 89, 94, 101, 102; procedure in connection with the build- of great Elizabethan houses, 89; direct relations of workpeople and owners, *ib.*; no mention of architects, *ib.*; curious extracts from letters of the artificers of Burghley House, 90; John Thorpe's connection with the buildings of Northamptonshire, 90, 91, 94, 95; Emily S. Hartshorne's "Memorials of "Holdenby" quoted, 92, 94; Camden quoted on the palace of Holdenby, 93; remains of work by Inigo Jones at Kirby Hall and Castle Ashby, 95, 101; long survival of the mullioned style, 102.
Appendix.—Letters from State Papers of Mary and Elizabeth regarding the building of Burghley House, 103;—A sixteenth century account for work at Henry VIII.'s manor of Rochester, 109.

Granger, F.—
Germany. *German Technical Museums,** 187. —Industrial Museums modelled on South Kensington, 188; frequently located in school buildings, *ib.*; industrial-art subordinate to technical instruction, *ib.*; free use of reproductions of the antique, *ib.*; classes of objects exhibited, 189; arrangement for a complete industrial museum, 190; the use of maps, charts, models, and photographs, *ib.*; architectural considerations, 191; the planning, *ib.*; special points to be kept in view, *ib.*; the library and reading-room, 192; materials, dimensions, and fittings of the cases, *ib.*; material for and arrangement of shelves, *ib.*; exhibition of textile specimens, 194; storage cupboards, *ib.*; electrical laboratories of technical high schools, *ib.*; fittings of rooms for drawing, *ib.*; trade continuation schools, 195; technical museums, *ib.*; industrial-art and trade museums, *ib.*; technical high schools, 204, 206; other technical schools, 210; continuation schools, 213; new streets and buildings in Berlin, 215; Ethnological Museum, Berlin, 217; Leipzig Academy of Art and University Library, *ib.*

Great Addington Manor House—
Materials of the design, 102.

Greece—
Building law in ancient Greece, 116; Athenian officials controlling buildings, water-supply, and boundaries, *ib.*
*Report of a tour in,** by R. E. Smith, 37.

Greek Archæological Society—
Excavations in Athens, 37; outside Athens, 49.

Greenwell, Canon—
On the erection and object of the Galilee of Durham Cathedral, quoted, 142.

Gwilt—
"Glossary" quoted, as to the uses of the Galilee of Durham Cathedral, 144.

Hall, E. T.—
Remarks on building legislation, 138.
Hartshorne, Emily S.—
"Memorials of Holdenby" quoted, 92, 94.
Hayward, C. F.—
Remarks on building legislation, 139.
Heaton's Cloisonné Mosaic—
Use in decoration of font, St. Margaret's, Westminster, 171.
Holdenby Palace—
Contemporary opinion of the palace, 92; wooden panel formerly in the palace,* 92, 93; purchased by James I. for a royal palace, 93; its condition in 1722, *ib.*; present extent of the remains, *ib.*

Inigo Jones—
Additions to Kirby Hall, 95; entrance screen at Castle Ashby by, 101.
Ireland—
Royal Institute of Ireland.—Alliance with The Royal Institute, 1.
Iron and Steel—
*Application to building purposes,** by F. T. Reade, 13.
Remarks by Prof. Aitchison, 36; R. L. Cole, *ib.*; Prof. Kerr, *ib.*; J. T. Perry, *ib.*; F. T. Reade, *ib.*; R. Walker, 35; T. H. Watson, 36.
Base plates—cast iron, on concrete, 22; dimensions, *ib.*; mode of junction with stancheons, *ib.*
"Builders' ironwork," 34.
Columns.—Cast iron, 16; mode of calculating strength, *ib.*; formula for, 17 *note*; proportion of length of hollow columns to diameter, 17; danger of unequal thickness in hollow columns, 18; method of placing on bed-stone, *ib.*; size of base flange, *ib.*; various kinds of junctions, 18, 33; columns and stancheons placed one above another, 18; use of solid columns very limited, 19.
Foundations and piers, 13;—Safe loads for various soils, 14; dimensions of base-stone and column base, *ib.*; nature, thickness, and area of concrete, 15;—Brick piers, *ib.*; limits of pressure on, *ib.*; dimensions of, *ib.*; ratio of brick footings and concrete to load to be carried, 16.
Girders and joists.—Cast iron,* 22; span of, *ib.*; the load and its distribution, 23; proportion of depth to span, 24; width of flanges, *ib.*; distance between vertical ribs, *ib.*;—Compound girders, or rolled joists with additional flange-plates riveted on, 27; limit of stress, *ib.*; mode of riveting, *ib.*; attachment to columns, 28;—Wrought iron and steel riveted girders, *ib.*; how to calculate the strength, *ib.*; designing girders, 28–32; the web and riveting, 30; importance of riveting being properly done, 31; effect of punching rivet-holes in steel, 32; long span girders, *ib.*;—Wrought iron and steel rolled joists, 25; application to fire-proof floors, *ib.*; sections and safe loads, 26; advantages of iron and steel joists contrasted, *ib.*; difficulty of distinguishing between iron and steel joists, 27 *note.*
Painting of ironwork, 33.
Shoring.—Adaptation of iron to, 32.
Stancheons.—Cast iron, 16; formula for calculating strength, 17 *note*; columns and stancheons placed one above another, 18; advantages of using ┼ or H section stancheons, 19; designing a stancheon of H section to place flat against a wall, 20; stancheons to carry shop fronts, *ib.*; stancheon on top of girder,* *ib.*;—Wrought iron and steel stancheons,* 21; safe loads for wrought iron stancheons, *ib.*; when use of steel advantageous, 22; junctions, 33.
Italy—
Baveno Church, 252.
Milan.—Church of San-Lorenzo, 70.
Pisa.—Splendid examples of pulpits, 173.
Villa of Antoninus Pius, 252.

Kelmarsh Hall, 89.
Kerr, Prof.—
Remarks on the application of iron and steel to building purposes, 36;—on building legislation, 138.
King's Sutton Manor House*—
Materials of the design, 102.
Kirby Hall*—
Date of laying the first stone, 94; its history, *ib.*; Stafford crest and cognisances on the parapet, *ib.*; additions by Inigo Jones, 95.

Lane-Poole, S.—
"Saracenic Art" quoted on the Arab house of Egypt, 229, 233, 234, 235.
Lectern—
Caerleon Church,* 175; Ingham Church, eagle lectern, 176; Llanbadern Fawr Church, eagle lectern, *ib.*
Leicester—
Leicester and Leicestershire Society.—Alliance with The Royal Institute, 1.
Lilford Hall*—
A fine example of the circular bay, 99; curious arrangement of the chimneys, *ib.*
Limburg Cathedral—
Font, 169.
Lincoln Cathedral—
Porch called a Galilee, 149, 150.
Liverpool—
Society.—Alliance with The Royal Institute, 1.
Llandaff Cathedral—
Font, 170; pulpit, 174; reredos, 178; stall work, 181.
London—
Building Law.—The earliest regulations, 117; Fitz-Aylwin's Assize of Buildings, *ib.*; regulations as to party-walls in 1419, *ib.*; summary of Building Acts, 118; Metropolitan Board of Works By-laws, 119, 120, 122.
City.—Reduction of number of houses, 116.
Hampstead.—Crowding together of houses in Broadhurst Gardens, 128.
Open spaces to inhabitants, compared with Paris and Vienna, 122.
Westminster.—Reduction of number of houses, 116.

London County Council—
Barking Creek Bill, 119; control over public buildings, 123; by-law as to the batter of chimney-shafts, 126.

Longstaffe, W. H. D.—
Name, date of erection, and use of Durham Cathedral Galilee, quoted, 144.

Lyveden New Building*—
Built for Sir Thomas Tresham, 95; sets forth the doctrine of the Passion, 96; the remarkable bay windows,* *ib.*; refinement of detail of two main cornices, *ib.*

Lyveden Old Building—
Handsome oak staircase, 97.

MacGibbon, D.
Romanesque Architecture. *The Architecture of Provence,** 69. Introduction of the same by the Phœnicians, *ib.*; influence of the Greeks and Romans, *ib.*; Provençal architecture in the time of Charlemagne, *ib.*; imitation of Roman forms, 70; church of Saint-Paul-trois-Châteaux,* 71; Notre-Dame-des-Doms, Avignon, *ib.*; Fréjus Cathedral,* 72, 77; chapel of Saint-Pierre, Montmajour,* 73; gradual introduction of the Gothic, 73-75; church of Saint-Trophime, Arles, 74; cloisters at Arles and Elne, *ib.*; porch of Saint-Gilles, Tarascon, 75; effects of intercourse with the Levant, 76; the vaulting of Provençal buildings, *ib.*; use of the pointed barrel-vault, *ib.*; the dome, *ib.*; its probable origin, *ib.*; effects of its employment, 77; the Cistercian or second phase of Provençal architecture, 78; "the three Provençal daughters "of Citeaux," *ib.*; abbey of Thoronet,* *ib.*; extreme contrast of the second phase with the Romanesque, 79; entire absence of ornament, *ib.*; its gradual extinction by the Northern Gothic, *ib.*; fortified churches, 80; military architecture, *ib.*; the system of city defences, 80, 81; Aigues-Mortes, 81; Avignon, *ib.*; Cruas Abbey, *ib.*; Villeneuve-lez-Avignon, *ib.*; watch-towers of the Mediterranean towns, *ib.*; principle of construction, *ib.*; Saint-Paul-du-Var keep, 82; castellated monastery of Saint-Honorat-de-Lérins,* *ib.*; a combined example of all the Provençal styles, *ib.*

Majolica—
As a substitute for marble in pulpit decoration, 175; eagle of lectern made in, 176.

Manchester—
Building regulations.—Width and gradients of streets, 121; public buildings, 123; definition of a public building, *ib.*
Society.—Alliance with The Royal Institute, 1;—Action with regard to public buildings, 123.

Metropolitan Board of Works—
By-laws, 119, 120, 122; attempted building legislation, 124, 129, 133.

Mosaic—
Heaton's cloisonné.—Decoration of font of St. Margaret's, Westminster, 171.
Rust's glass.—Use in ornamentation of church font, 171; of pulpit, 174.

Mykene*—
Discovery of remains of an extensive palace, 54; traces of three distinct epochs, *ib.*; description of remains, *ib.*;—The Megaron, 55;—Remains of a private dwelling,* 56; plan,* 57.

Narbonne Cathedral—
Fortifications of, 80.

Nevill, R.—
Remarks on the Renaissance in Northamptonshire, 113.

Newcastle—
Northern Association.—Alliance with The Royal Institute, 1.

Newton, Sir C. T.—
Royal Gold Medal presented to, 2.

Nicholl, S. J.—
Note on the use of the Galilee porch, 164.
Remarks on the Galilee of Durham Cathedral, 152;—on church fittings, 186.

Norden, John—
"Delineation of Northamptonshire" quoted, 88; on the palace of Holdenby, 93.

Northamptonshire*—
The Renaissance in, by J. A. Gotch, 87.
Renaissance builders.—Lord Burghley (Sir Wm. Cecil), 88-92; Thomas Cecil, 91; the Cokaynes, 98; Edward Griffin, Attorney-General to Queen Mary, 89; Sir Christopher Hatton, 88, 91-94, 96; Sir Walter Mildmay, 92; Sir Humphrey Stafford of Blatherwick, 88, 94; Sir Thomas Tresham, 88, 95-98, 101.
Renaissance buildings and remains.—Apethorpe Hall,* 98; Burghley House, 89, 103; Canons Ashby,* 100; Castle Ashby, 101, 102; cottages at Brigstock and Geddington, 101; date stones at Bulwick, Twywell, and Weldon,* 102; Dingley Hall, 89, 102; Drayton House,* 99; gable at Raunds,* 101; Great Addington Manor House, 102; Holdenby Palace,* 91; King's Sutton Manor House,* 101, 102; Kelmarsh Hall, 89; Kirby Hall,* 90, 94, 102; Lilford Hall,* 98, 99, 102; Lyveden New Building,* 95, 97; Lyveden Old Building, 97; Pilton Manor House, 99; Pytcherley Hall, 88; Rockingham Castle,* 99, 100; Rothwell Market House,* 96, 103; Rushton Hall,* 97; Triangular Lodge, Rushton,* 96, 103; Weekley Almshouse,* 102; Wothorpe House,* 91.

Norwich Cathedral—
Pulpit,* 174; altar-rails, 177.

Nottingham—
Society.—Alliance with The Royal Institute, 1.

Olympia, 52

Open Spaces—
Area of open space to inhabitants in London, Paris, and Vienna compared, 122.

Palace—
Athens.—Supposed remains of the palace of Erechtheus, 31.
Holdenby,* 92.
Mykene, 54, 68.
Theobalds, 93.
Tiryns, 68.

Paley—
On early English church fonts, quoted, 169.
Papworth, W.—
Remarks on the Renaissance in Northamptonshire, 113.
Paris—
Area of open space to inhabitants compared with London and Vienna, 122; height of buildings in the Boulevard-Sebastopol and Place-du-Prince-Eugène,* 130.
Domes of the Fine and Liberal Arts palaces, 4.
Eiffel Tower, 4, 14.
International Exhibition, 4.
Palace of the Trocadero, 5.
Party Wall—
Rome.—Institution of the party-wall, 202 B.C., 117.
London.—Regulations in 1419, 117; prohibition of wooden party-walls in 1707, 119; existing regulations, 132.
Parvise—
English and French meaning of the word, 151 *note*.
Penrose, F. C.—
Cited on the curvature of the base of the Parthenon, 41; on the site of Eleusis, 50
Notes on a tour in Greece and Cyprus,* 66;—Temple of Aphrodite, Cyprus, 66;—The Acropolis, *ib.*; the Propylæa, *ib.*;—Temple of Ceres,* Eleusis, 67;—the remains at Epidauros,* *ib.*;—The Palace at Mykene, 68.
St. Stephen's, Walbrook,* 243.—Description of the church from Wren's "Parentalia," *ib.*; arrangement of the plan* and harmony of the proportions, 244; extreme lightness of the structure, 245; section through centre of dome,* *ib.*; commensurability of adjacent parts, *ib.*; ratio of proportions in the plan and the section, 246; arrangement of the columns under the cupola, 247; alterations made in the interior, *ib.*; substitution of square for octagonal-shaped pedestals to the columns, *ib.*; engravings of 1746 and 1750 showing square pedestals, 248; replacing of part of Wren's altar-piece,* *ib.*
Perry, J. T.—
Remarks on the application of iron and steel to building purposes, 36.
Persia—
Persian tiles used in Arab houses in Cairo, 231.
Serbistan. — Perforated domes fitted with coloured glass, 233.
Peterborough Cathedral—
The "library," called a Galilee, 149.
Pilton Manor House—
A many-gabled building, 99
Presidential Addresses—
On opening of Session 1889-90, 1.
On presentation of prizes, 8.
Provence*—
The Architecture of, by D. MacGibbon, 69.
Aigues-Mortes.—The walls, towers, and gateways, 81; the Tour Blanche, or citadel, *ib.*
Aix-en-Provence.—Cathedral,* porch, 71.
Antibes.—The cathedral, 82; the two keeps, *ib.*
Arles.—Church of Saint-Gabriel, 73 *note*; church of Saint-Trophime, 74, 79; the cloister, 74.
Avignon.—Church of Notre-Dame-des-Doms, 71; city walls and defences, 81; machicolations of the Pope's palace, *ib.*
Beaucaire Castle, 81.
Béziers. — Church of Sainte-Nazaire, 79;—Cathedral, 80; ornamental machicolations and parapets, *ib.*
Cannes Church, 79.
Carcassonne.—The double walls and towers, 80; the castle, 81; the Porte-Narbonnaise, *ib.*
Citeaux Abbey, 78.
Cruas Abbey, 81; its defences, *ib.*
Elne.—The cloister, 74.
Fréjus.—The cathedral,* 72, 77, 80; the baptistery, 72; plan,* 77, 78; fortified square tower inclosing eastern apse, 80; the cloister,* 80.
Marseilles.—Church of Saint-Victor, 79, 80.
Montmajour.—The monastery, 73; chapel of Sainte-Croix, 73, 74; chapel of Saint-Pierre,* 73, 74, 75; the keep, 81.
Narbonne—Church of Saint-Just, 80;—The cathedral, *ib.*; fortifications of, *ib.*
Perigueux.—Church of Saint-Front, 77.
Perpignan.—Church of Saint-Jean, 80;—The castle, 81.
Saint-Césaire church, 79.
Saint-Honorat-de-Lérins.—Chapel of Sainte-Trinité,* 71, 72, 85;—The monastery,* 82; castle and monastery combined, 83; the cloister, 83; design of caps and bases,* 83, 84; varied style of architecture, 84.
Saint-Maximin Church, 80.
Saint-Paul-du-Var.—Church, 78; peculiar construction of the keep, 82.
Saint-Paul-trois-Châteaux.—Church of,* 71.
Sénanque monastery, 78.
Silvacane monastery, 78.
Tarascon.—Portal of church of Saint-Gilles, 75; —the castle, 81.
Thoronet.—Abbey of,* 78, 83, 84.
Vallauris Church, 79.
Villeneuve-lez-Avignon. — Castle of Saint-André, 81.
Pullan, R. P.—
Notice of the late Mr. Pullan, F.S.A., by Prof. Aitchison, 249.—Birth, parentage, and education, *ib.*; early career, *ib.*; visit to Sebastopol: sketches and models of the country made during the seige, *ib.*; antiquarian researches in Greece and Asia Minor, 250-252; competitions entered into, 251; list of his publications and those in which he assisted, *ib. note*; his principal executed works, 252; completed Burges's works left unfinished, *ib.*; abstract of preface to "Byzantine Architecture," *ib.*; his marriage to Miss Mary L. Burges, 254; death from bronchitis, *ib.*
Pulpit—
Bechworth Church, 174;—St. Barnabas, Gorse Hill,* *ib.*;—Great Kimble Church, 175; —Great Yarmouth: St. James, 175; St. Nicholas, 169;—Llandaff Cathedral, 174;—

Pulpit (*continued*)—
St. James, Paddington, *ib.*;—Ullenhall Church, 175.
Italy.—Splendid examples of pulpits, 173.
Ruskin quoted on the decoration of pulpits, 173.
Pytcherley Hall, 88

Raine—
"Brief Account of Durham Cathedral," quoted, 150.
Reade, F. T.—
Iron and Steel. *The application of iron and steel to building purposes,** 13.
Foundations and piers, 13;—Cast-iron columns and stancheons, 16;—Wrought-iron and steel stancheons,* 21;—Cast-iron base plates, 22;—Cast-iron girders,* *ib.*;—Wrought-iron and steel rolled joists, 25;—Compound girders, 27;—Wrought-iron and steel riveted girders, 28;—Adaptation of iron to shoring, 32;—Painting of ironwork, 33;—General principles, *ib.*
Reichensperger, Dr.—
On the attitude of the State towards the British architect (quoted), 2.
Renaissance in Northamptonshire*—
Paper, by J. A. Gotch, 87.
Appendix.—The building of Burghley House: letters from State Papers of Mary and Elizabeth, 103;—A sixteenth century account for work at the King's manor of Rochester, 109.
Remarks by E. G. Bruton, 114; J. M. Brydon, *ib.*; S. F. Clarkson, *ib.*; R. Nevill, 113; W. Papworth, *ib.*; P. Waterhouse, 114.
Reply, by J. A. Gotch, 114.
Report of a Tour in Greece and Cyprus*—
Paper, by R. E. Smith, 37.
Notes on, by F. C. Penrose, 66.
Reredos—
St. Saviour's, Bath, 178; Llandaff Cathedral, 178; St. Peter Mancroft, Norwich, *ib.*; St. James, Paddington, *ib.*
Ridge, L. W.—
Remarks on building legislation, 139.
Robins, E. C.—
Remarks on building legislation, 137.
Rochester—
A sixteenth-century account for work done at King Henry VIII.'s manor, 109.
Rochester Cathedral—
Choir desks and stalls,* 181, 182.
Rockingham Castle—
Doorway and window in the courtyard,* 99, 100; the garden front, 100.
Rome—
Building regulations in ancient Rome, 117; restrictions attached to landed property, *ib.*; institution of the party-wall and rights of light and prospect, *ib.*
Rothwell New Market House*—
A typical Elizabethan building, 96; its general appearance of elaborate richness, *ib.*; coarseness of the detail, *ib.*; never had a roof, *ib.*
Royal Gold Medal—
Presented to Sir C. T. Newton, 2.
Royal Institute of British Architects—
President's Address on opening of Session, 1.—Alliance of non-metropolitan Architectural Societies with The Royal Institute, *ib.*;—Statistics of the Institute for 1888-89, 2;—Royal Gold Medal presented to Sir C. T. Newton, *ib.*;—Sir A. Blomfield knighted, 3;—The amended Articles of Pupilage, *ib.*;—The Examinations, 3, 6;—The Soane Medallion, 4;—Paris International Exhibition, *ib.*; the Eiffel Tower, *ib.*; domes of the Fine and Liberal Arts palaces, *ib.*; the Trocadero palace, 5;—Professional Education, 6;—Birmingham Assize Courts, 8.
President's Address on presentation of prizes, 8.—Sheffield Municipal Buildings Competition, *ib.*
Rushton Hall*—
Dates on certain parts, 97, 98; additions by Sir Thomas Tresham, 98; and by the Cokaynes, *ib.*; one of the best specimens of Renaissance, *ib.*
Rushton Triangular Lodge*—
Sets forth the doctrine of the Trinity, 96; an extreme type of Elizabethan quaint conceits, *ib.*
Ruskin, J.—
On the decoration of pulpits, quoted, 173.
Rust's Glass Mosaic—
Use in decoration of church font, 171; of pulpit, 174.

St. Paul's Cathedral—
Relation of heights of internal and external columns and pilasters, 246.
St. Stephen's, Walbrook*—
Paper, by F. C. Penrose, 243.
Scotland—
Rights to ancient lights non-existent, 132.
Screen—
Ingham Church, sumptuous chancel-screen, 183.
Wooden panel in Holdenby Church from screen in Holdenby Palace,* 93.
Seddon, J. P.—
*Church Fittings.**—Desirability of a collection of designs, 165; Mr. Micklethwaite's "Modern "Parish Churches," 166, 176; W. Butterfield's "Instrumenta Ecclesiastica," 166; fittings should correspond in character with the church, *ib.*; suitability of the Perpendicular style, 167; Paper of the Committee of the Consulting Architects of the Incorporated Church Building Society, quoted, 167–181 *passim*; the native Gothic style, 168; introduction of Continental ideas, *ib.*; arrangement of interior and fittings suited to modern churches, *ib.*; position of organ chamber, 169, 184;—Fonts, 169; T. Combe's "Illus-"trations of Baptismal Fonts," *ib.*; Paley and Viollet-le-Duc, quoted, *ib.*;—Pulpits, 173; Mr. Ruskin on the decoration of pulpits, *ib.*;—Lecterns, 175;—The altar, 176; altar-rails, *ib.*;—The reredos, 177;—Seats, 178;—Choir desks and stalls, 180;—Screens, 181;—Rood-loft, 183.
Font and cover designed by,* 172.
Designs for church fittings, presented to the Institute Library by, 183 *note.*
Seymour, Lord—
Attempt to establish a Building Court, 134.

Sheffield—
Municipal Buildings competition, 8.
Society.—Alliance with The Royal Institute, 1.

Slater, J.—
Building in towns. *Building Legislation,** 115. —Importance of the subject, *ib.*; necessity for legislation, *ib.*; rapid growth of towns, *ib.*; increase of greater London in the present century, 116; insufficiency of the present regulations, *ib.*; Greek building law, *ib.*; regulations in ancient Rome, 117; power to control height of buildings in Rome and Byzantium, *ib.*; the earliest metropolitan regulations, *ib.*; Fitz-Aylwin's Assize of Buildings, *ib.*; the "Liber Albus" of the City of London, *ib.*; condition of London before the Great Fire, 118; legislation following the Great Fire, *ib.*; summary of Metropolitan Building Acts, *ib.*;—Model of an exhaustive Building Act for a great city, 120; provisions necessary for construction of streets, *ib.*; width of streets in towns, 121; street sewerage and gradients, *ib.*; alignment of frontages, 122; provision for open spaces, *ib.*; definition of a public building, *ib.*; regulations as to public buildings, 123; the prevention of fire, 124–126; cubical contents of buildings, 124; openings between buildings, *ib.*; powers and duties of district surveyors, 124, 125, 127, 133, 134–136; warehouses and trade buildings, 125; stability of buildings, 126; thickness and height of walls, *ib.*; control over materials and details of buildings, *ib.*; sanitary regulations, 127; crowding together of houses in large towns, 128; height of buildings, 129–131; relations between adjoining owners, 131; party-walls, *ib.*; light and prospect, *ib.*; ruinous, dangerous, and neglected structures, 132; buildings exempted from control, *ib.*; settlement of building disputes, 133; administration of a Building Act, 134; necessity of restricting the rights of individuals, *ib.*

Smith, R. E.
Greece and Cyprus. *Report of a tour in Greece and Cyprus.**—Greece, 37; excavations by the Greek Archæological Society, *ib.*;—The Acropolis, *ib.*; the Erechtheion, 38; stone foundations of supposed temple, *ib.*; Temple of Roma and Augustus, *ib.*; the Parthenon, *ib.*; the Propylæa, 42; Theatre of Dionysos, 46;—Eleusis,* 49; Temple of Artemis, 50; arch of Hadrian, *ib.*; Temple of Pluto, *ib.*; Great Hall of Initiation,* *ib.*;—Dionyso, 51; a choragic monument,* 52;—Ægina, *ib.*;—Tiryns, 52, 54, 56;—Olympia, 52;—Bassæ, *ib.*; Temple of Apollo Epikourios, 53;—Epidauros, *ib.*; Temple of Asklepios, *ib.*; the theatre,* 54;—Mykene,* *ib.*—Cyprus, 57;—Hill fortress of Leondari Vouno, *ib.*; Temple of Aphrodite, 57.

Smith, T. R.—
Remarks on building legislation, 139.

Spiers, R. Phené—
*Notes on the Arab house of Egypt,** 228.—The inspiration of Saracenic domestic architecture, *ib.*; features of the exteriors, *ib.*; the entrance doorways, *ib.*; the chief court, *ib.*; the reception-rooms, 229; diverse opinions as to the distinction between the mandarah and the ka'ah, *ib.*; features distinguishing them, *ib.*; rich ornamentation of the ceilings, 230; the courtyard,* 231; the mandarah,* 232; general description of plan, *ib.*;—The "House of the Mufti," * 233; the mandarah, 233–236; the decoration of wall surfaces, *ib.*; the fountain in the durka'ah,* 234; accurate jointing of the voussoirs of the arches, 235; the windows of the mandarah, 236;—A house at Damascus,* *ib.*; similarity of plan to that of Cairene house, *ib.*; style of decoration, 237.
Remarks on the architecture of Provence, 85.

Street, G. E.—
The probable origin of barrel-vaulting in Spain (cited), 76.

Tarver, E. J.—
Remarks on the architecture of Provence, 85;—on church fittings, 186.

Temple—
Agrigentum, 257.
Athens.—Dionysos, 47; Jupiter Olympius, 67; Parthenon, 38; Roma and Augustus, 38.
Bassæ.—Apollo Epikourios, 53.
Cyprus.—Aphrodite, 57, 66.
Eleusis.—Artemis, 50; Ceres * (the Great Hall of Initiation), 49, 67; Pluto, 50.
Epidauros.—Asklepios, 53.
Italy.—Juno Sospita, 252.
Kulakli.—Apollo Smintheus, 250.
Nîmes.—Temple of the Nymphs, 76.
Priene.—Minerva Polias, 251.
Teos.—Bacchus, 250.

Theatre—
Athens.—Dionysos, 46, 67.
Epidauros,* 54, 67.
New York.—Theatre with front to street only,* 123.
Oropos, 67.

Theobalds Palace—
Purchased by James I. for a royal palace, 93.

Thessalonica—
Church of Santa-Sophia destroyed by fire, 254 *note.*

Thorpe, John—
His small scale drawing of Burghley House, 91; laid the first stone of Kirby Hall, 94, 102; his plan of Holdenby Palace, 95; his connection with Lyveden New Building, *ib.*

Tiryns—
Palace of the ancient kings, 54, 68.

Vienna—
Area of open space to inhabitants compared with London and Paris, 122.

Viollet-le-Duc—
Abbey churches of Cluny and Vézelay, quoted, 151.
Early church fonts in France, quoted, 169, 170.

Walker, R.—
Remarks on the application of iron and steel to building purposes, 35.

Waterhouse, A.—
Presidential Address, 1.
Address on presentation of prizes, 8.
Remarks on church fittings, 186.
Waterhouse, P.—
Remarks on the Renaissance in Northamptonshire, 114.
Watson, T. H—
Remarks on the application of iron and steel to building purposes, 36.
Weekley Almshouse*—
Quaint doorway and inscription, 102.
Westminster—
Decrease of number of houses in, 116.
St. Margaret's, 171; variegated marble font, *ib.*
White, W.—
Galilee Porch. *The Galilee of Durham Cathedral: its name and its nature*,* 141.—Lack of definite evidence as to its purpose or the meaning of the name, *ib.*; commonly supposed to be a Lady chapel, *ib.*; authorities quoted as to its supposed object, 142–146; probably intended as a judicial court, 146; evidence supporting that theory, 146–152; coincidences between the Galilees of Durham and Ely cathedrals,* 147; court of the Lord High Warden held in transeptal annexe of Old St. James' Church, Dover, in the middle ages,* 148; other instances of buildings attached to cathedrals and churches to which the name has been given, 149; erections analogous to the Galilee not so named, 151; the parvise, *ib.*; similar provision at the church of Charité-sur-Loire and the abbey churches of Cluny and Vézelay, *ib.*
Notes on Church Fittings, 184.
Remarks on the architecture of Provence, 85.
Willson, T. J.—
Remarks on the Galilee of Durham Cathedral, 153.
Wilson, A. N.
Remarks on the architecture of Provence, 86.
Woodward, W.—
Remarks on church fittings, 186.
Wothorpe House*—
Date of erection, 91; remains of, *ib.*

ILLUSTRATIONS.

LIST OF PLATES AND LITHOGRAPHS.

Frontispiece.—Portrait of the late Charles Robert Cockerell, R.A., President in 1860–61.

LXV.
The Application of Iron and Steel to Building Purposes.

Illustn. i.—Example of a column with turned flange junction; and with turned socket junction.
Illustn. ii.—Example of a stancheon to carry two main girders and one rolled joist; and to carry a single main girder and two 14-inch joists.

LXVI.
Report of a Tour in Greece and Cyprus.

Illustn. iii.—Plan of Excavations at Eleusis, 1885–87.
Illustn. iv.—The Tholos at Epidauros: marble capital from the Corinthian Order of the inner peristyle.
Illustn. v.—The Theatre at Epidauros.
Illustn. vi.—Plan showing foundations of the Palace and Temple recently excavated at Mykene.
Illustn. vii.—Temple of Aphrodite, Palæo-Paphos, Cyprus.
Illustn. viii.—Mosaic pavement in the South Stoa of same.

LXVII.
The Architecture of Provence.

Illustn. ix.—The Church of Saint-Paul-trois-Châteaux.
Illustn. x.—Chapel of the Sainte-Trinité, Saint-Honorat-de-Lérins.
Illustn. xi.—The cloister of Fréjus Cathedral.
Illustn. xii.—The cathedral tower and bishop's palace at Fréjus.
Illustn. xiii.—Interior of Fréjus Cathedral.
Illustn. xiv.—The Abbey of Thoronet: the church.
Illustn. xv.—The castellated monastery of Saint-Honorat. Plans, section, and sketch.
Illustn. xvi.—Lower cloister of same, from the south-west.
Illustn. xvii.—Upper cloister of same.
Illustn. xviii.—Lower cloister of same, from the south-east.

LXVIII.
The Renaissance in Northamptonshire.

Illustn. xix.—Dingley Hall: Gateway to the Arcade.
Illustn. xx.—Lyveden New Building: Details.
Illustn. xxi.—Lyveden New Building.
Illustn. xxii.—West front of Rushton Hall, 1595; Gable in courtyard of Rushton Hall; Chimney of the triangular lodge at Rushton.
Illustn. xxiii.—Rushton Hall, from the east.
Illustn. xxiv.—Principal front of Lilford Hall.
Illustn. xxv.—Drayton House: the cellars, 1584.
Illustn. xxvi.—A corner of the courtyard at Kirby Hall.
Illnstn. xxvii.—One side of the same.
Illustn. xxviii.—Archway in the same.
Illustn. xxix.—Entrance to Weekley Hospital.

LXX.

The Galilee of Durham Cathedral: its Name and Nature.

Illustn. xxx.—The west front of Durham Cathedral.
Illustn. xxxi.—The Galilee, looking east.
Illustn. xxxii.—The same, from the north-west corner.

LXXI.

Church Fittings.

Illustn. xxxiii.—Elevation of the pulpit: Norwich Cathedral.

LXXIII.

The Arab House of Egypt.

Illustn. xxxiv.—A street view in Cairo.
Illustn. xxxv.—Court of an old house at Cairo.
Illustn. xxxvi.—House of the late Count St. Maurice, Cairo.
Illustn. xxxvii.—Marble mosaic decoration in the Bordheny Mosque, Cairo.
Illustn. xxxviii.—Marble pavement in the "House "of the Mufti," Cairo.
Illustn. xxxix.—Court of an old house at Cairo (woodcut).

LXXIV.

St. Stephen's, Walbrook.

Illustn. xl.—Transverse section through the centre of the dome, looking east, prior to 1850.
Illustn. xli.—Transverse section: east end, 1847–48.
Illustn. xlii.—Transverse section: west end, 1847–48.

LXXVI.

Charles Robert Cockerell, R.A.

Facsimile of a pencil sketch-portrait of Cockerell, about 1815–16, signed "Ingres à Madame "Cockerell" (woodcut).

LIST OF DIAGRAMS IN TEXT.

LXV.

1. A stancheon on top of girder . . 19
2. Wrought-iron stancheons . . . 21
3. Cast-iron girders 25

LXVI.

4. Excavations on the Acropolis at Athens: unfinished marble drums for the Parthenon columns . . 39
5. Sketches of bronze tools found near the sub-basement of the Parthenon . 40
6. The Parthenon—View along the north side, showing the curvature of the second step of the stylobate . . 41
7. Plan of the pier at the north-west angle of the south-west hall . . . 43
8. Section of a step of the Propylæa stylobate 43
9. Vertical section showing form of joint on Propylæa walls 44
10. Horizontal section showing the form of joint on same 44
11. Plan of door jamb to the Pinakotheka . 44
12. Sketch of marble jamb showing sinkings for wood blocks 44
13. Section through north-east hall . . 45
14. Plan of the pier at the angle between the east portico and north-east hall . 45
15. View of the north-east hall of the Propylæa 46
16. Elevation showing method of working the ends of stones; the centre is sunk 47
17. Plan showing Z-form cramp . . 47
18. Plan showing T-form cramp . . 47
19. Section through seats and part of orchestra: Theatre of Dionysos . . 49
20. Section through Choragic monument . 52
21. Plan of same 52
22. Full-size sections of the fluting to Ionic columns in the Cella at Bassæ 53
23. Section through rim of hearth at Mykene 55
24. House at Mykene 57
25. The first pre-Roman period, Temple of Aphrodite 60
26. The second pre-Roman period . . 61
27. South Stoa, north-west angle of ambulatory wall and the triangular block 63
28. The third pre-Roman period . . 64
29. Roman construction 64

LXVII.

30. Aix-en-Provence Cathedral 71
31. Chapel of the Sainte-Trinité, Saint-Honorat-de-Lérins 72
32. Entrance to the same 72
33. The baptistery at Fréjus Cathedral . 73
34, 35. Chapel of Saint-Pierre, Montmajour 74, 75
36. Fréjus Cathedral 77
37. Caps and bases in the cloister of Saint-Honorat-de-Lérins . . . 83, 84

LXVIII.

38. Remains of one of the towers, at Wothorpe 91
39. Plan and section of a panel in a screen at Holdenby 92
40. Gable at Kirby Hall (east side) . . 93
41. Chimneys at Kirby Hall (east side) . 93
42. Stone moulding and stop, Kirby Hall . 94
43. Impost carried round as architrave, in same 94
44. Stone details at same 95
45. Rothwell Market House . . . 96
46. Rushton Hall: part of screen . . 97
47. Gable in courtyard of Apethorpe Hall . 98
48. Finials at Apethorpe Hall . . . 98

49. At Rockingham Castle 99
50. Entrance to Canons Ashby . . . 99
51. Gable at Raunds 100
52. King's Sutton Manor House . . 101
53. Some date stones (at Bulwick, Weldon, and Twywell) 102

LXIX.

54. A theatre with front to street only, in New York 123
55. Height of houses: Grosvenor Gardens, London, S.W. 130
56. Height of houses: Grosvenor Place, London, S.W., 1867 130
57. Height of houses: Boulevard-Sebastopol, Paris 130
58. Height of houses: Place-du-Prince-Eugène, Paris 130

LXX.

59. Ground plan of the Galilee: Durham Cathedral 142
60. Ground plan of Durham Cathedral . 144
61. The Galilee of Ely Cathedral . . 147
62. Church of "Old St. James," Dover: transeptal chancel aisle. Court of the Lord Warden 149
63. Section through centre arch of the above 149
64. Cluny Abbey Church (now destroyed) . 151
65. Plan of the Abbey Church of Vézelay . 154
66. Section through the same: ante-nave and part of nave 155
67. Plan of the Church of Paray-le-Monial, near Autun 156
68. West elevation of the same . . . 157
69. Section through ante-nave and nave of the same 157
70. Plan of the Church of Pontigny, near Auxerre 158
71. Plan of San-Clemente, Rome . . 158
72. Plan of San-Apollinare-Nuovo at Ravenna 158
73. Plan of Church at Parenzo, Istria . 159
74. Plan and section of Church at Roueiha, Central Syria 159
75. Plan of the Church of Romainmotier, Diocese of Lausanne . . . 160
76. View of the same 160
77. Nave columns and arches in the same 160
78. Plan of the Abbey Church of Valdedios, Oviedo 160
79. Longitudinal section of the same . . 160
80. Western portal or open porch of San-Vicente, Avila 161

LXXI.

81. Font and cover: Rotherham Church . 171
82, 83, 84. Half-section, elevation, and plans of a font and cover, designed by John P. Seddon 172
85, 86. Plan and elevation of pulpit at Gorse Hill Church, Swindon . . 174
87, 88. Plan and elevations of lectern, Caerleon Church 175
89, 90. Front and end elevations of altar-table, Glewstone Church . . . 177
91. Seats: Arminghall Church . . . 179
92. Combination of chairs: Church at Grangetown, near Cardiff . . 180
93. Elevation (towards nave) of stalls: Rochester Cathedral 182
94. Front elevation of same . . . 182

LXXII.

95. Hamburg Trade Museum: ground plan 196
96. Industrial-Art Museum, Berlin: plans 198
97. View of same 199
98. Hanover Technical High School: arrangement for holding charts and drawings 209
99, 100. Hamburg Trade School; drawing table with movable stand; chair for drawing-board . . . 211
101, 102. Hamburg Trade School: stands for casts; lithographer's desk . . 212
103. School of the Handworkers' Union, Dresden: desk 214

LXXIII.

104. Plan of Mandarah, or men's reception-room 224
105. Plan of Ka'ah, or women's reception-room 224
106, 107. A house in Cairo: ground plan; first-floor plan 229
108, 109. A house in Cairo: second-floor plan; top-floor plan 230
110. A house in Cairo: the courtyard . . 231
111. A house in Cairo: the mandarah . 232
112. Mandarah in the "House of the "Mufti": plan 234
113. Fountain in the durka'ah of the same . 234
114, 115. Sections through the same . . 235
116. House at Damascus: ground-floor plan 236

LXXIV.

117. Plan of St. Stephen's, Walbrook . . 244
118. Transverse section through the centre of the dome 245

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